2022 Economic Impact

of Houston Ship Channel Activity

MARTIN ASSOCIATES

Prepared by:
Martin Associates

PORT HOUSTON

2022 Economic Impact of Marine Cargo Activity at the Houston Ship Channel:

Executive Summary

Conducted by Martin Associates
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Overview of the Houston Ship Channel

The Houston Ship Channel consists of public marine terminals owned by the Port of Houston Authority (PHA) as well as private marine terminals located along the Houston Ship Channel. The public marine the Houston Public Grain Elevator #2, the Fentress Bracewell Barbours Cut Container Terminal, the Bayport Container Terminal, the Bulk Materials Handling Plant, Jacintoport, the Care Terminal, the PHA Terminals in the Houston Turning Basin and the Woodhouse Terminal. Private terminals include the petroleum refineries, general cargo terminals, (e.g., Manchester Terminal, Greensport Terminal, etc.), the petrochemical plants and the dry bulk/fertilizer terminals.

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Economic Impact Analysis Methodology

Martin Associates was retained by the Port of Houston Authority of Harris County, Texas (PHA) to measure the local and regional economic impacts generated by cargo and vessel activity at the Port of Houston Authority's marine terminals as well as the impacts generated at the private marine terminals along the Houston Ship Channel.

The impacts are measured for the year 2022 and separate economic impact models have been developed to measure the impacts generated by the PHA facilities and the impacts generated by the total marine cargo and vessel activity at both the public and private marine terminals. These economic models can be used to estimate annual updates, as well as to test the sensitivity of the impacts to changes in such factors as marine cargo tonnage levels, labor productivity and work rules, new marine facilities development and expansion and the impacts of harbor and channel deepening. The models can also be used to compare the economic impacts of marine activity.

For the most part, the same methodology has been used to estimate the 2022 economic impacts as was used to estimate the economic impacts of the Houston Ship Channel in 2018. Therefore, the results of this study can be directly compared to those of the earlier study, which measures the economic impacts of activity in 2018.

The study is based on interviews with nearly 1,000 firms providing services to the cargo and vessels handled at the PHA's marine terminals and the private terminals along the Houston Ship Channel. The data collected from the interviews was then used to develop operational models of the PHA public and private marine terminals.

2022 Economic Impact of the Houston Ship Channel - Summary of Results

1,540,417 jobs supported by Port activity

- Direct Jobs: 78,308
- Induced Jobs: 138,161
- Indirect Jobs: 68,787
- Related Jobs: 1,255,160

$439.2 billion of total economic value - 18.6% of State GDP

- $29.6 billion of direct business revenue
- $20.3 billion of re-spending of direct income and local consumption purchases
- $389.3 billion of output supported with related port users

$10.6 billion of state and local taxes

- $2.6 billion of direct, induced and indirect state and local taxes
- $8.0 billion of state and local taxes with related exporters and importers supported by port activity

2022 Houston Ship Channel Economic Impact Results

The public and private marine terminals at the Houston Ship Channel supported 1,540,417 direct, induced, indirect and related jobs in the state of Texas in 2018. Of these 1,540,417 jobs, 78,308 **direct jobs** are generated by the marine cargo and vessel activity, of which 72 percent reside in Harris County. The cargo activity at the PHA facilities creates about 30,161 direct jobs. In addition, there are nearly 48,148 direct jobs created by the movement of cargo at the private terminals.

As the result of local and regional purchases by those 78,308 individuals holding the direct jobs, an additional **138,161 induced jobs** are supported in the regional economy. An additional **68,787 indirect jobs** were supported by $7.2 billion of local purchases by businesses supplying services at the marine terminals and by businesses dependent upon the marine terminals.

Jobs related to the marine cargo imported and exported via the public and private marine terminals accounted for 1,255,160 jobs. These jobs with Texas importers and exporters are considered to be related to activities at the public and private marine terminals, but the degree of dependence on these terminals is less direct than the direct, induced and indirect impacts. These jobs include the portion of jobs at importing and exporting firms that are directly associated with the cargo moved via the Houston Ship Channel marine terminals, but not generated by the actual port operations. It is the demand for the product that generates employment and other impacts with the shippers/consignees.

The **total economic value to the state of Texas** resulting from the marine cargo activity at the public and private marine terminals in 2022 is estimated at **$439.2 billion.** This consists of the direct business revenue of $29.6 billion, the re-spending and local consumption impact of $20.3 billion and the related user output of $389.3 billion. This dollar value represents the sphere of influence of the public and private marine terminals in 2022 and accounts for 18.6 percent of the $2.4 trillion Gross Domestic Product (GDP) for the state of Texas.

Direct wages and salaries of $6.5 billion were received by 78,308 directly employed, resulting in an average annual salary of $83,613. This salary compares to an average statewide salary of $54,230. As the result of re-spending this income, an additional $20.3 billion of income and consumption expenditures were created. The 68,787 indirect job holders received $2.8 billion of indirect wages and salaries. An additional $92.5 billion was received by related port users. In total, **about $122.1 billion of total personal wages and salaries** were supported by maritime activity at the public and private terminals located at the Houston Ship Channel.

State and local taxes supported by activity at the marine terminals totaled nearly **$10.6 billion,** which includes $2.6 billion of direct, induced, and indirect state and local tax revenue as well as nearly $8.0 billion of state and local taxes that were supported by the economic activity of related users of the cargo moving through the port.

2022 Houston Ship Channel Economic Impact Results – Houston Ship Channel Authority Terminals

Of the 1,540,417 jobs held by Texas residents that are related to marine cargo and vessel activity at the Houston Ship Channel, **979,495 jobs are supported by activity at the Houston Ship Channel Authority terminals**. Of these 979,495 total jobs, **30,161 direct jobs are generated by marine cargo activity at the PHA terminals.** As the result of local purchases by these 30,161 directly employed individuals, an additional 52,705 induced are generated in the local economy.

About $2.8 billion of local purchases by firms providing services to the PHA marine terminals supported an additional **26,494 indirect jobs**. The balance, 870,135 jobs are classified as related jobs and are with importers and exporters and supporting firms using the Houston Ship Channel terminals in 2022.

In 2022, marine cargo activity at the PHA terminals supported a total of **$262.0 billion of total economic value in the state of Texas**. Of the $262.0 billion, $9.0 billion is the direct business revenue received by the firms directly dependent upon the marine cargo activity at the PHA terminals. An additional **$245.2 billion represents the value of the output to the state of Texas** that is supported by the cargo moving via the Houston Ship Channel marine terminals. This includes the value added at each stage of producing an export cargo, as well as the value added at each stage of production for the firms using imported raw materials and intermediate products that flow via the marine terminals and are consumed within the state. The remainder, $7.7 billion, represents the personal re-spending and local personal consumption impact.

Marine cargo activity at the PHA owned, leased, or affiliated facilities **supported $81.3 billion of total personal wage and salary income and local consumption expenditures for Texas residents.** This includes $11.3 billion of direct, indirect and re-spending and local consumption expenditures, while the remaining $70.0 billion was received by the related port users as personal income.

A total of $984.0 million of direct, induced, and indirect state and local tax revenue was generated by maritime activity at the public terminals along the Houston Ship Channel. In addition, $6.1 billion of state and local taxes was supported due to the economic activity of the related users of the cargo moving via the public marine terminals.

2018 vs. 2022 Impact Marine Cargo Comparison

Growth of Economic Impacts at the Houston Ship Channel: 2018-2022

189,722 new jobs supported by cargo activity	•11,270 direct jobs •35,279 induced jobs •13,684 indirect jobs •129,490 related jobs
$100.2 billion increase in total economic value to the state	•$4.4 billion direct revenue •$7.7 billion re-spending of income/local consumption •$88.1 billion related output increase

Between 2018 and 2022 total cargo handled at the public and private terminals at the Houston Ship Channel increased by 17.3 million tons. The gain in cargo over the period was with bulk cargo, primarily petroleum and liquid bulk cargoes, as well as containerized and break-bulk cargo. As the result of the overall growth in cargo, direct jobs increased by 11,270 new jobs since 2018. Induced jobs grew by 35,279 jobs, reflecting the growth in the direct jobs, as well as the increase in the average direct income from $69,123 in 2018 to $82,689 in 2022. This growth in average income resulted in an increase in the re-spending impact. When direct, induced, and indirect jobs are considered, the port activity at the public and private marine terminals increased by about 60,232 jobs primarily due to the growth in jobs associated with the growth in bulk and containerized cargo. Jobs with importers and exporters using the public and private marine terminals grew by 129,490 jobs, also reflecting the growth in containerized cargo. The total economic value in the state of Texas supported by the marine cargo activity at the Houston Ship Channel grew by nearly $100.2 billion and state and local taxes supported by the marine cargo activity grew by $5.0 billion since 2018.

Conclusion

The public and private marine terminals at the Houston Ship Channel continue to be an economic engine for the Houston area, Harris County, and the state of Texas. The importance of the port's public and private marine terminals to the state is underscored by the fact that the total value of the economic impact of the public and private marine terminals is measured at $439.2 billion, 18.6 percent of the State's Gross Domestic Product. Furthermore, the marine cargo activity at the Houston Ship Channel public and private marine terminals supported 1,540,417 jobs in the state of Texas.

THE 2022 ECONOMIC IMPACT OF MARINE CARGO ACTIVITY AT THE HOUSTON SHIP CHANNEL ON THE STATE OF TEXAS AND THE UNITED STATES

May 9, 2023

Prepared by:
Martin Associates

SUMMARY

The Houston Ship Channel consists of public marine terminals owned by the Port of Houston Authority ("PHA") as well as private marine terminals located along the Houston Ship Channel. The public marine terminals include the Houston Public Grain Elevator #2, the Fentress Bracewell Barbours Cut Container Terminal, the Bayport Container Terminal, the Bulk Materials Handling Plant, Jacintoport, the Care Terminal, the PHA Terminals in the Houston Turning Basin, and the Woodhouse Terminal. Private terminals include the petroleum refineries, general cargo terminals (e.g., Manchester Terminal, Greensport Terminal, etc.), the petrochemical plants and the dry bulk/fertilizer terminals along the Houston Ship Channel included in the Houston Ship Channel District. In 2022, these public and private marine terminals in the Houston Ship Channel District handled 256.8 million tons of international and domestic cargo for exporters and importers located within the state of Texas, as well as throughout the United States. It is the purpose of this study to quantify the economic impacts generated by the cargo and vessel activity at these marine terminals both on the state of Texas, as well as the United States.

The purpose of this current study is to update the economic impacts of the Houston Ship Channel and to also provide a measure of the economic impacts of the port on the U.S. economy. The analysis is based on the structural models developed by Martin Associates as part of the 2022 economic impact study conducted for the Port of Houston Authority[1]. To estimate the economic impacts on the national economy, Martin Associates developed national induced and indirect models, as well as national impact models for the related users sector. This sector consists of the importers and exporters using the Houston Ship Channel's public and private marine terminals for containerized cargo; heavy equipment manufactures of agricultural, construction and mining equipment exporting and importing through the Houston Ship Channel facilities; farmers exporting grain via the terminals; importers of steel products located both in Texas as well as throughout the U.S.; and users and manufacturers of the petroleum products and petrochemical products moving via the port's marine terminals. In addition to the jobs with these exporters and importers that are using the port, the related user impacts also include the support industries that are involved in providing goods and services to produce a specific export item moving via the port, or support manufacturers and retailers using imported cargo that moves through the port. It is important to emphasize that these related impacts are not necessarily generated by the Houston Ship Channel, as the employment levels are based on the demand for the goods exported and imported via the port, but at the given point in time in 2022, these jobs with importers and exporters and the industries supporting these exporters and importers are related to the port, and underscore the far reaching geographical sphere of influence of the port in 2022.

Exhibit 1 shows the impacts of the Houston Ship Channel cargo operations on the U.S., while Exhibit 2 presents the economic impacts on the state of Texas. The biggest difference between the

[1] The Local and Regional Economic Impacts of the Port of Houston - 2022, prepared for the Port of Houston Authority, by Martin Associates, April 19, 2023.

economic impacts on the United States vs. Texas are the related economic impacts, as these impacts are with the importers and exporters using the Houston Ship Channel facilities and underscores the national economic significance of the port's public (PHA owned terminals) and private terminals. In addition, the induced and indirect impacts are larger for the nation than for the state, as these induced and indirect impacts and local purchases by individuals and firms reflect the total national impacts, rather than those just for the state. Also, federal, state, and local taxes are estimated for the total United States impact of the Houston Ship Channel.

Exhibit 1

Summary of the 2022 Economic Impacts of the Houston Ship Channel on the United States Economy

	Terminals	Terminals	
JOBS			
Direct	30,161	48,148	78,308
Induced	65,099	105,602	170,702
Indirect	28,810	45,992	74,802
Subtotal	*124,070*	*199,742*	*323,812*
Related	1,159,053	1,882,355	3,041,408
Total	1,283,123	2,082,096	3,365,220
PERSONAL INCOME(MILLIONS)			
Direct	$2,494	$4,054	$6,548
Re-spending/Local Personal Consumption	$9,904	$16,099	$26,003
Indirect	$1,165	$1,859	$3,024
Subtotal	*$13,563*	*$22,011*	*$35,574*
Related	$93,321	$97,925	$191,246
Total	$106,884	$119,936	$226,820
TOTAL ECONOMIC VALUE (MILLIONS)			
Direct Business Revenue	$9,036	$20,521	$29,557
Re-spending/Local Personal Consumption	$9,904	$16,099	$26,003
Related Output	$342,740	$507,651	$850,392
Total Economic Value	$361,681	$544,271	$905,951
LOCAL PURCHASES (MILLIONS)	$2,774	$4,429	$7,203
FEDERAL/STATE/LOCALTAXES (MILLIONS)			
Direct	$690	$1,122	$1,812
Induced	$2,740	$4,454	$7,194
Indirect	$322	$514	$837
Subtotal	*$3,752*	*$6,090*	*$9,842*
Related	$25,819	$27,093	$52,912
Total	$29,571	$33,183	$62,754

Totals may not add due to rounding

Exhibit 2
Summary of the 2022 Economic Impacts of the Houston Ship Channel on the State of Texas

	PHA Terminals	Private Terminals	Total
JOBS			
Direct	30,161	48,148	78,308
Induced	52,705	85,456	138,161
Indirect	26,494	42,294	68,787
Subtotal	*109,360*	*175,897*	*285,257*
Related	870,135	385,025	1,255,160
Total	979,495	560,922	1,540,417
PERSONAL INCOME(MILLIONS)			
Direct	$2,494	$4,054	$6,548
Re-spending/Local Personal Consumption	$7,743	$12,586	$20,329
Indirect	$1,071	$1,710	$2,780
Subtotal	*$11,308*	*$18,349*	*$29,657*
Related	$69,990	$22,481	$92,471
Total	$81,298	$40,829	$122,128
TOTAL ECONOMIC VALUE (MILLIONS)			
Direct Business Revenue	$9,036	$20,521	$29,557
Re-spending/Local Personal Consumption	$7,743	$12,586	$20,329
Related Output	$245,175	$144,158	$389,332
Total Economic Value	$261,953	$177,264	$439,218
LOCAL PURCHASES (MILLIONS)	$2,774	$4,429	$7,203
STATE/LOCALTAXES (MILLIONS)			
Direct	$217	$353	$570
Induced	$674	$1,095	$1,769
Indirect	$93	$149	$242
Subtotal	*$984*	*$1,596*	*$2,580*
Related	$6,089	$1,956	$8,045
Total	$7,073	$3,552	$10,625

Totals may not add due to rounding

In 2022, cargo activity at the public and private marine terminals at the Houston Ship Channel supported 3,365,220 direct, induced, indirect and related jobs in the United States, of which 1,540,417 jobs were supported in the state of Texas:

- 78,308 are **direct** jobs. These jobs are generated by activities at the port, and if such activities should cease, the jobs would be discontinued over the short term. It is these jobs that are most directly dependent upon the Houston Ship Channel. The direct jobs are with the International Longshoremen's Association, terminal operators, dependent shippers/consignees, stevedores, trucking firms, railroads, steamship agents, freight forwarders and customhouse brokers, warehousemen, federal and state government agencies, towing companies, pilot organizations, and marine construction companies, etc. The majority, about 77 percent, of the direct jobs are held by residents of Harris County.

- 170,702 are **induced** jobs, or those jobs supporting the local and national purchases made by the 78,308 individuals holding the direct jobs due to port activity. Should the direct jobs be lost from the economy, the induced jobs supported by the purchases of the direct jobs would also be lost. Jobs with grocery stores, retail outlets, restaurants, transportation services, government services, schools and hospitals are examples of induced jobs. Of the 170,702 induced jobs, 138,161 were induced jobs held by Texas residents.

- The firms' dependent upon the Houston Ship Channel made $7.2 billion of purchases for office supplies, equipment, utilities, communications, maintenance and repair services, transportation services, professional services and goods and services. These purchases supported 74,802 **indirect** jobs in the national economy, of which 68,787 were created in the state.

- In addition to the direct, induced and indirect job impacts, the port activity supports 3,041,408 jobs throughout the United States, of which 1,255,160 related jobs are in the state of Texas. These jobs are considered to be **related** to activities at the port, but the degree of dependence on the port is difficult to estimate and should not be considered as dependent on the port as are the direct, induced and indirect jobs. If the Houston Ship Channel were not available to these organizations, they would suffer an economic penalty over the longer term. Such a penalty would vary from a loss of employment opportunities in some cases to an increase in total transportation costs in other cases, which could, in turn, result in employment reductions and corporate relocations.

In 2022, marine cargo activity at the public and private marine terminals along the Houston Ship Channel supported a total of $906.0 billion of total U.S. economic value, of which $439.2 billion of total economic value was supported in the state of Texas. The PHA facilities supported $361.7 billion of total economic value to the U.S. economy.

- Of the $906 billion of total U.S. economic value, $29.6 billion is the direct business revenue received by the firms directly dependent upon the port and providing maritime services and inland transportation services to the cargo handled at the marine terminals and the vessels calling the port, as well as ship and rig repair and maintenance services. An additional $850.4 billion represents the value of the output to the United States that is created due to the cargo moving via the Houston Ship Channel public and private marine terminals. This includes the value added at each stage of producing an export cargo, as well as the value added at each stage of production for the firms using imported raw materials and intermediate products that flow via the marine terminals and are consumed within the state. The majority of these user impacts are associated with the imported steel products receipts. In addition, $26.0 billion of the re-spending of personal income and local consumption purchases are supported in the U.S. economy. These components are additive and represent independent monetary impacts supported by the cargo and vessel activity. Other dollar value impact measures are not included in the total economic value since they are interdependent. Direct income is not included since it is part of the direct business impact and similarly, local purchases by the firms are from the direct business revenue generated by port activity, and also used to pay indirect income. Finally, taxes are paid by the individuals from the direct, induced, indirect and related income and the direct business revenue and the related output.

- Marine activity supported nearly $226.8 billion of total personal wage and salary income and local consumption expenditures in the United States. This includes $26.0 billion of direct, indirect, induced and local consumption expenditures in the U.S., while the remaining $191.2 billion was received by the related port users throughout the United States. The 78,308 direct job holders received $6.6 billion of direct wage and salary income, for a direct annual salary of $83,613.

A total of $62.7 billion of federal, state, and local tax revenue in the U.S. was supported by maritime activity at the public and private terminals along the Houston Ship Channel. Of the $62.7 billion of federal, state, and local tax revenue supported in the U.S., $10.6 billion of state and local taxes was supported in the state of Texas.

THE LOCAL AND REGIONAL ECONOMIC IMPACTS OF THE HOUSTON SHIP CHANNEL, 2022

April 19, 2023

Prepared by:
Martin Associates

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EXECUTIVE SUMMARY

Martin Associates was retained by the Port of Houston Authority of Harris County, Texas ("PHA") to estimate the economic impacts generated by marine cargo activity at the public and private marine terminals located along the Houston Ship Channel. The public marine terminals are those owned, leased, or operated by the Port of Houston Authority and include the Houston Public Grain Elevator #2, the Fentress Bracewell Barbours Cut Container Terminal, the Bayport Container Terminal, the Bulk Materials Handling Plant, Jacintoport, the Care Terminal, the PHA Terminals in the Houston Turning Basin and the Woodhouse Terminal. Private terminals include the petroleum refineries, general cargo terminals (e.g., Manchester Terminal, Greensport Terminal, etc.), the petrochemical plants and the dry bulk/fertilizer terminals.

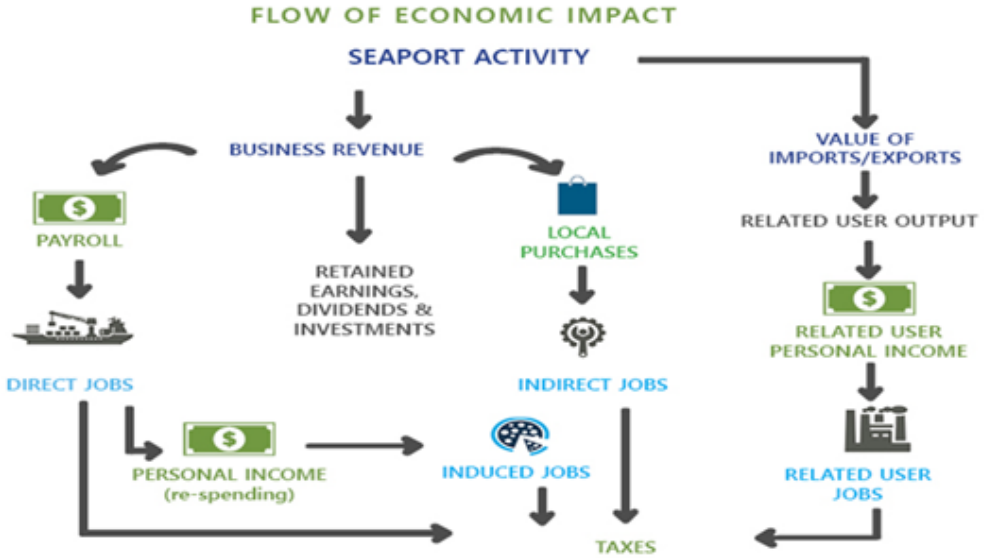
The impacts are measured for the year 2022 and separate economic impact models have been developed to measure the impacts generated by the PHA public facilities and the impacts generated by the total marine cargo and vessel activity at both the public and private marine terminals. These economic impact models can be used to estimate annual updates, as well as to test the sensitivity of the impacts to changes in such factors as marine cargo tonnage levels, labor productivity and work rules, new marine facilities development and expansion and the impacts of harbor and channel deepening. The models can also be used to compare the economic impacts of marine activity with non-maritime development of waterfront land.

For the most part, the same methodology has been used to estimate the 2022 economic impacts as was used to estimate the economic impacts of the Port of Houston in 2018[1]. Therefore, the results of this study can be directly compared with those of the earlier study.

Exhibit E-1 graphically demonstrates how seaport activity impacts the local and regional economies. As this exhibit indicates, the marine cargo and vessel activity initially generate business revenue to the firms supplying marine services. This revenue is used to purchase employment (direct jobs) to provide the services, to pay stockholders and for retained earnings and to purchase goods and services from local firms, as well as national and international firms (creating indirect jobs with these firms). Businesses also pay taxes from the business revenue.

[1] The Local and Regional Economic Impact of the Port of Houston, 2018, prepared for the Port of Houston Authority, March 22, 2019, by Martin Associates.

Exhibit E-1
Flows of Economic Impacts through the Economy



The employees hired by the firms receive wages and salaries (personal income), a portion of which is saved, while another portion is used to buy goods and services such as food, housing, clothing, health care, etc. These purchases create a re-spending impact throughout the economy, known as the personal income multiplier. As a result of these local purchases, additional jobs (known as induced jobs) are created in the local economy. Local purchases are also made by the firms directly dependent upon the Houston Ship Channel, including the petroleum refineries and petrochemical plants located along the Houston Ship Channel, as well as firms providing services to the port such as stevedores, terminal operators, trucking firms and railroads, steamship lines and agents and freight forwarders. The local purchases by directly dependent firms create indirect jobs. Finally, taxes are paid by individuals employed with the firms providing the services to the marine terminals and by the firms directly dependent upon the port.

As demonstrated by this chart, four types of impacts are measured:

- Jobs
- Employee earnings
- Business revenue
- State and local taxes

With respect to jobs, four types of job impacts are measured. These are direct, induced, indirect and related jobs. The job impacts are defined as follows:

- Direct jobs are those jobs with local firms providing support services to the seaport. These jobs are dependent upon this activity and would suffer immediate dislocation if the seaport activity were to cease. Seaport direct jobs include jobs with railroads and trucking companies moving cargo to and from the PHA's marine terminals and private terminals, members of the International Longshoremen's Association (ILA) and non-ILA dockworkers, steamship agents, freight forwarders, ship chandlers, warehouse operators, bankers, lawyers, terminal operators, and stevedores.

- Induced jobs are jobs created locally and throughout the regional economy due to purchases of goods and services by those directly employed. These jobs are with grocery stores, the local construction industry, retail stores, health care providers, local transportation services, local and state government agencies providing public services and education to those directly employed and businesses providing professional and business services in support of those directly employed. These goods and services would also be discontinued if seaport activity were to cease.

- Indirect jobs are those jobs generated in the local economy as the result of local purchases by the firms directly dependent upon seaport activity. These jobs include jobs in local office supply firms, equipment and parts suppliers, maintenance and repair services, insurance companies, consulting, and other business services. If port operations were discontinued, these indirect purchases and the associated jobs and income would also be discontinued.

- Related jobs are jobs that are determined to be related to physical cargo that is exported and imported via the Houston Ship Channel public and private marine terminals in 2022. These jobs include the portion of jobs at importing and exporting firms that are directly associated with the cargo moved via the Houston Ship Channel marine terminals, but not generated by the actual port operations. It is the demand for the product that generates employment and other impacts with the shippers/consignees. See "related user impacts" below for more details.

The personal income impact consists of wages and salaries and includes a re-spending effect (local purchases of goods and services by those directly employed) as well as the wages paid to indirect jobs holders, while business revenue consists of total business receipts by firms providing services in support of the marine activity. State and local taxes include taxes paid by individuals, as well as firms dependent upon the seaport activity.

In addition to the direct impacts, induced and indirect impacts also support activity with regional exporters and importers using the Houston Ship Channel's public and privately owned marine terminals. These impacts are classified as ***related user impacts*** in that the exporters and importers using the marine

terminals can and do use other ports for the shipment and receipt of cargo. The related user impacts are the jobs, income, revenue and state and local taxes related to the value and tonnage of the cargo exported and imported via the Houston Ship Channel public and private marine terminals in 2022 and does not include the total employment, revenue and taxes with the importers and exporters, only that portion associated with the cargo moved via the Houston Ship Channel marine terminals. The related impacts measure the impact or influence, of the port's marine terminals at a given point in time and if the port's terminals were no longer used by these importers and exporters, these influenced users would use other ports to export and import cargo. Unlike the direct, induced, and indirect impacts, the related impacts would not necessarily be dislocated from the economy – instead, the impacts would no longer be related to the Houston Ship Channel, but to another port through which this cargo would be routed.

The study is based on interviews with 986 firms providing services to the cargo and vessels handled at the PHA's marine terminals and the private terminals along the Houston Ship Channel. Furthermore, the impacts can be traced back to the individual firm. The data collected from the interviews was then used to develop an operational model of the PHA public and private marine terminals.

SUMMARY OF IMPACTS GENERATED BY THE HOUSTON SHIP CHANNEL

The economic impacts generated by the public and private marine terminals are summarized in Exhibit E-2.

Exhibit E-2
Summary of the Local and Regional Economic Impacts Generated by the Houston Ship Channel Public and Private Marine Terminals

	PHA Terminals	Private Terminals	Total
JOBS			
Direct	30,161	48,148	78,308
Induced	52,705	85,456	138,161
Indirect	26,494	42,294	68,787
Subtotal	*109,360*	*175,897*	*285,257*
Related	870,135	385,025	1,255,160
Total	979,495	560,922	1,540,417
PERSONAL INCOME(MILLIONS)			
Direct	$2,494	$4,054	$6,548
Re-spending/Local Personal Consumption	$7,743	$12,586	$20,329
Indirect	$1,071	$1,710	$2,780
Subtotal	*$11,308*	*$18,349*	*$29,657*
Related	$69,990	$22,481	$92,471
Total	$81,298	$40,829	$122,128
TOTAL ECONOMIC VALUE (MILLIONS)			
Direct Business Revenue	$9,036	$20,521	$29,557
Re-spending/Local Personal Consumption	$7,743	$12,586	$20,329
Related Output	$245,175	$144,158	$389,332
Total Economic Value	$261,953	$177,264	$439,218
LOCAL PURCHASES (MILLIONS)	$2,774	$4,429	$7,203
STATE/LOCALTAXES (MILLIONS)			
Direct	$217	$353	$570
Induced	$674	$1,095	$1,769
Indirect	$93	$149	$242
Subtotal	*$984*	*$1,596*	*$2,580*
Related	$6,089	$1,956	$8,045
Total	$7,073	$3,552	$10,625

Totals may not add due to rounding

Specifically, the public and private marine facilities generated the following impacts in the state of Texas in 2022:

- **1,540,417 jobs in Texas** are in some way related to the cargo moving via the public and private marine terminals at the Houston Ship Channel.

- Of the 1,540,417 jobs in Texas, **78,308 direct jobs** are generated by the marine cargo and vessel activity at the public and private marine terminals. About 72 percent of these direct jobs are held by residents of Harris County.

- As the result of local and regional purchases by those 78,308 individuals holding the direct jobs, an additional **138,161 induced jobs** are supported in the regional economy.

- **68,787 indirect jobs** were supported by $7.2 billion of local purchases by businesses supplying services at the marine terminals and by businesses dependent upon the Houston Ship Channel.

- The balance, 1,255,160 jobs are classified as related jobs and are with importers and exporters and supporting firms using the Houston Ship Channel public and private marine terminals in 2022.

In 2022, marine cargo activity at the public and private marine terminals along the Houston Ship Channel supported a total of $439.2 billion of total economic value in the state of Texas. This represents about 18.6 percent of the $2.4 trillion state of Texas Gross Domestic Product[2].

- Of the $439.2 billion, $29.6 billion is the direct business revenue received by the firms directly dependent upon the port and providing maritime services and inland transportation services to the cargo handled at the marine terminals and the vessels calling the port. An additional $389.3 billion represents the value of the output to the state of Texas that is created due to the cargo moving via the Houston Ship Channel public and private marine terminals. This includes the value added at each stage of producing an export cargo, as well as the value added at each stage of production for the firms using imported raw materials and intermediate products that flow via the marine terminals and are consumed within the state. The majority of these user impacts are associated with the containerized cargo and imported steel products receipts. In addition, $20.3 billion of the re-spending of personal income and local consumption purchases are supported in the local and regional economy. These components are additive and represent independent monetary impacts supported by the cargo and vessel activity. Other dollar value impact measures are not included in the total economic value since they are interdependent.

[2] U.S. Bureau of Economic Analysis, 2022 GDP for state of Texas (preliminary)

Direct income is not included since it is part of the direct business impact and similarly, local purchases by the firms are from the direct business revenue generated by port activity and also used to pay indirect income. Finally, taxes are paid by the individuals from the direct, induced, indirect and related income and the direct business revenue and the related output.

- Marine activity supported $122.1 billion of total personal wage and salary income and local consumption expenditures for Texas residents. This includes $29.7 billion of direct, indirect, induced, and local consumption expenditures, while the remaining $92.5 billion was received by the related port users. The 78,308 direct job holders received $6.5 billion of direct wage and salary income, for a direct annual salary of $83,613. This compares to $54,230, which is the mean annual salary in 2021 for all workers in the state of Texas, as reported by the U.S. Bureau of Labor Statistics.

A total of $2.6 billion of direct, induced, and indirect state and local tax revenue was generated by maritime activity at the public and private terminals along the Houston Ship Channel. In addition, $8.0 billion of state and local taxes were created due to the economic activity of the related users of the cargo moving via the public and private marine terminals. The total tax impact, including the impact of the related port users is nearly $10.6 billion.

HOUSTON SHIP CHANNEL PUBLIC TERMINAL IMPACTS

The jobs, income, revenue, and tax impacts generated by the Houston Ship Channel's marine terminals are a subset of the port-wide impacts discussed in the previous section. It is important to separately identify and develop an economic impact model of the impacts generated by the Houston Ship Channel's marine terminals, in order to assess the impacts of new public investment in port facilities and to provide a tool to assist the Port of Houston Authority in future public port planning decisions. The impacts summarized in this section are those generated by the Houston Ship Channel's marine cargo terminals, including Houston Public Grain Elevator #2, Fentress Bracewell Barbours Cut Terminal, Bayport Container Terminal, PHA Terminals at the Turning Basin, Jacintoport, Care Terminal, Bulk Materials Handling Plant, and the Woodhouse Terminal.

- Of the 1,540,417 jobs held by Texas residents that are related to marine cargo and vessel activity at public and private marine terminals along the Houston Ship Channel, **979,495 jobs are in some way influenced by activity at the Port of Houston Authority owned, leased, or operated terminals.**

- Of the 979,495 total jobs are in some way related to the Houston Ship Channel's marine terminals, **30,161 direct jobs are generated by marine cargo activity at the PHA terminals**.

- As the result of local purchases by these 30,161 directly employed individuals, an additional **52,705 induced jobs are generated in the local economy.**

- About $2.8 billion of local purchases by firms providing services to the PHA marine terminals supported an additional **26,494 indirect jobs**.

- The balance, 870,135 jobs are classified as related jobs and are with importers and exporters and supporting firms using the Houston Ship Channel terminals in 2022.

In 2022, marine cargo activity at the PHA owned and leased public marine terminals supported a total of $261.9 billion of total economic value in the state of Texas.

- Of the $261.9 billion, $9.0 billion is the direct business revenue received by the firms directly dependent upon the port and providing maritime services and inland transportation services to the cargo handled at the marine terminals and the vessels calling the port, as well as ship and rig repair and maintenance services. An additional $245.2 billion represents the value of the output to the state of Texas that is created due to the cargo moving via the Houston Ship Channel's marine terminals. This includes the value added at each stage of producing an export cargo, as well as the value added at each stage of production for the firms using imported raw materials and intermediate products that flow via the marine terminals and are consumed within the state. The remainder, $7.7 billion represents the personal re-spending and local personal consumption impact.

- Marine activity at the PHA owned or leased facilities supported $81.3 billion of total personal wage and salary income and local consumption expenditures for Texas residents. This includes $11.3 billion of direct, indirect, and re-spending and local consumption expenditures, while the remaining $70.0 billion was received by the related port users as personal income.

A total of $984 million of direct, induced, and indirect state and local tax revenue was generated by maritime activity at the public terminals along the Houston Ship Channel. In addition, $6.1 billion of state and local taxes were created due to the economic activity of the related users of the cargo moving via the public marine terminals. In total $7.1 billion of state and local taxes were supported by marine cargo activity at PHA terminals.

COMPARISON OF PORT-WIDE IMPACTS WITH THE 2018 IMPACT MEASURES

Between 2018 and 2022, total cargo handled at the public and private terminals at the Houston Ship Channel declined by 7.1 million tons. The loss of cargo was concentrated with liquid and dry bulk cargo, most notably a loss of petroleum exports and imports from 2018 levels, as well as a lower volume of steel imports in 2022 compared to 2018 levels. Offsetting the loss in these cargoes was a growth of 5.4 million tons of containerized cargo port wide. Liquid bulk, primarily petrochemical

exports and domestic shipments, increased over the period, despite the lower petroleum exports and imports. Between 2018 and 2022, petroleum imports and exports fell by 27.6 million tons while petrochemical exports and imports grew by 24.4 million tons. The import and export of containerized cargo is more labor intensive then the handling of import and exported petroleum, and similarly the export of petrochemical products is more labor intensive on a per ton basis than the handling of export and import petroleum. Therefore, the strong growth in containerized cargo over the period along with the 24-million-ton growth in petrochemical cargo resulted in a growth in overall economic impacts supported by the public and private terminals along the Houston Ship Channel within the Houston Ship Channel District.

Direct jobs increased by 11,270 new jobs since 2018. Induced jobs grew by 35,279 jobs, reflecting the growth in the direct jobs, as well as the increase in the average direct income from $69,565 2018 to $83,613 in 2022. This growth in average income resulted in an increase in the re-spending impact, in turn supporting increased induced jobs and local consumption impact. When direct, induced, and indirect jobs are considered, the port activity at the public and private marine terminals increased by 60,232 jobs due primarily to the growth in jobs associated with the growth in containerized cargo and petrochemicals and other liquid bulk cargoes. Jobs with importers and exporters using the public and private marine terminals grew by 129,490 jobs, also reflecting the growth in containerized cargo as well as petrochemical exports. The total economic value of the Houston Ship Channel public and private terminals to the state of Texas grew by $100.2 billion, reflecting the total economic value supported by containerized cargo and liquid bulk cargo moving via these terminals.

Exhibit E-3 presents a comparison of the total impacts generated by both public and private terminals.

Exhibit E-3
Comparison of Direct Economic Impacts: 2018-2022
Public and Private Marine Facilities

	2022	2018	Change
JOBS			
Direct	78,308	67,039	11,270
Induced	138,161	102,882	35,279
Indirect	68,787	55,103	13,684
Subtotal	*285,257*	*225,024*	*60,232*
Related	1,255,160	1,125,671	129,490
Total	1,540,417	1,350,695	189,722
PERSONAL INCOME(MILLIONS)			
Direct	$6,548	$4,664	$1,884
Re-spending/Local Personal Consumption	$20,329	$12,645	$7,684
Indirect	$2,780	$2,227	$553
Subtotal	*$29,657*	*$19,536*	*$10,121*
Related	$92,471	$54,723	$37,748
Total	$122,128	$74,260	$47,868
TOTAL ECONOMIC VALUE (MILLIONS)			
Direct Business Revenue	$29,557	$25,135	$4,421
Re-spending/Local Personal Consumption	$20,329	$12,645	$7,684
Related Output	$389,332	$301,259	$88,073
Total Economic Value	$439,218	$339,040	$100,178
LOCAL PURCHASES (MILLIONS)	$7,203	$5,684	$1,519
STATE/LOCALTAXES (MILLIONS)			
Direct, Induced, Indirect	$2,580	$1,485	$1,095
Related	$8,045	$4,159	$3,886
Total	$10,625	$5,644	$4,981

Totals may not add due to rounding

COMPARISON OF PHA SUPPORTED IMPACTS WITH THE 2018 IMPACT MEASURES

Between 2018 and 2022, tonnage handled at PHA terminals increased by 14.2 million tons and reflects an 8.4-million-ton increase in containerized cargo handled at the PHA container terminals since 2018. In addition, significant tonnage increases since 2018 were recorded for dry bulk cargoes including grain exports, forest products imports, liquid and dry bulk cargoes, steel products, bagged cargo, and miscellaneous break bulk cargoes.

Exhibit E-4 shows the changes in economic impacts supported by the cargo handled at the PHA owned and leased marine terminals.

Exhibit E-4

Comparison of Direct Economic Impacts: 2018-2022

Public and Private Marine Facilities

JOBS	PHA Terminals 2022	PHA Terminals 2018	Change
Direct	30,161	21,109	9,051
Induced	52,705	32,222	20,483
Indirect	26,494	17,351	9,143
Subtotal	*109,360*	*70,683*	*38,677*
Related	870,135	627,494	242,641
Total	979,495	698,177	281,318
PERSONAL INCOME(MILLIONS)			
Direct	$2,494	$1,459	$1,035
Re-spending/Local Personal Consumption	$7,743	$3,956	$3,787
Indirect	$1,071	$701	$370
Subtotal	*$11,308*	*$6,117*	*$5,191*
Related	$69,990	$30,202	$39,788
Total	$81,298	$36,319	$44,980
TOTAL ECONOMIC VALUE (MILLIONS)			
Direct Business Revenue	$9,036	$5,362	$3,674
Re-spending/Local Personal Consumption	$7,743	$3,956	$3,787
Related Output	$245,175	$164,074	$81,101
Total Economic Value	$261,953	$173,392	$88,561
LOCAL PURCHASES (MILLIONS)	$2,774	$1,790	$984
STATE/LOCALTAXES (MILLIONS)			
Direct	$217	$111	$106
Induced	$674	$301	$373
Indirect	$93	$53	$40
Subtotal	$984	$465	$519
Related	$6,089	$2,295	$3,794
Total	$7,073	$2,760	$4,313

Since 2018, the overall jobs supported by the cargo moving via the PHA owned and leased facilities grew by 281,318 total direct, induced, indirect, and related jobs. The direct jobs generated by the PHA owned and leased marine terminals grew by 9,051 jobs. Induced jobs increased by 20,483 as the result of the increased number of direct jobs as well as the growth in the average salary of the direct job holders. The average salary received by the direct jobs' holders increased from $69,123 to $82,689 over the period reflecting the growth in wages especially in trucking. Indirect jobs increased by 9,143 jobs due to the increased local purchases of nearly $1.0 billion since 2018. As the result of the growth in containerized cargo handled at PHA facilities, an additional 242,641 users' jobs were supported by the activity at the PHA terminals, reflecting the growing sphere of influence of the Houston Ship

Channel to serve importers/exporters in Texas that were previously served via out of state ports.

The overall economic value in the State that the cargo handled at the PHA facilities increased by $88.6 billion and the state and local taxes supported by the cargo operations at the PHA facilities increased by $4.3 billion since 2018.

In summary, the public and private marine terminals at the Houston Ship Channel continue to be an economic engine for the Houston area, Harris County, and the state of Texas. The importance of the port's public and private marine terminals to the state is underscored by the fact that the total value of the economic impact of the public and private marine terminals is measured at $439.2 billion in terms of total economic value to the state in 2022 and 1,540,417 jobs in the state of Texas are related to the marine activity at the public and private terminals along the Houston Ship Channel.

I. OVERVIEW OF THE ANALYSIS AND SUMMARY OF RESULTS

Martin Associates was retained by the Port of Houston Authority of Harris County, Texas ("PHA") to measure the local and regional economic impacts generated by cargo and vessel activity at the Houston Ship Channel marine terminals, including Houston Public Grain Elevator #2, Fentress Bracewell Barbours Cut Container Terminal, Bayport Container Terminal, Bulk Materials Handling Plant, Jacintoport, Care Terminal, the PHA Terminals in the Houston Turning Basin and the Woodhouse Terminal, as well as the impacts generated at the private marine terminals along the Houston Ship Channel, which include petroleum refineries, petrochemical plants, general cargo facilities (e.g., Manchester Terminal, Greensport, Texas Terminals, etc.) and dry bulk terminals. Impacts are estimated in terms of jobs, personal earnings, business revenue and state and local taxes, resulting from marine cargo and vessel activity in 2022. In addition to quantifying the baseline impacts of the Houston Ship Channel marine terminals and the impacts of the private marine terminals, two economic impact models have been developed – one specifically for the PHA's marine terminals and the other for the combined activity at private marine terminals and the PHA- owned or leased terminals. These models can be used in evaluating the sensitivity of impacts to changes in tonnage, labor productivity, labor work rules, commodity mix, inland origins/destinations of commodities and vessel size. The models can also be used to evaluate the impacts of new terminal development and channel dredging and widening, as well as for annual updates.

The methodology used in this analysis has been developed by Martin Associates and has been used to estimate the economic impacts of seaport activity at public and private marine terminals of more than 500 United States and Canadian ports. This study is essentially an update of the economic impact study conducted for the Port of Houston Authority in 2018. With respect to other Texas ports, Martin Associates has developed economic studies for the Ports of Brownsville, Beaumont, Port Arthur, Harlingen, Orange, Victoria, Texas City, Corpus Christi, Freeport, Galveston, and Port LaVaca-Point Comfort. Martin Associates has also developed the statewide economic impact model for the state of Texas. The methodology has been used in studies that have been presented before the International Trade Commission, the Council of Economic Advisors, the Federal Reserve Board, the Canadian Justice Department and several U.S. Presidents.

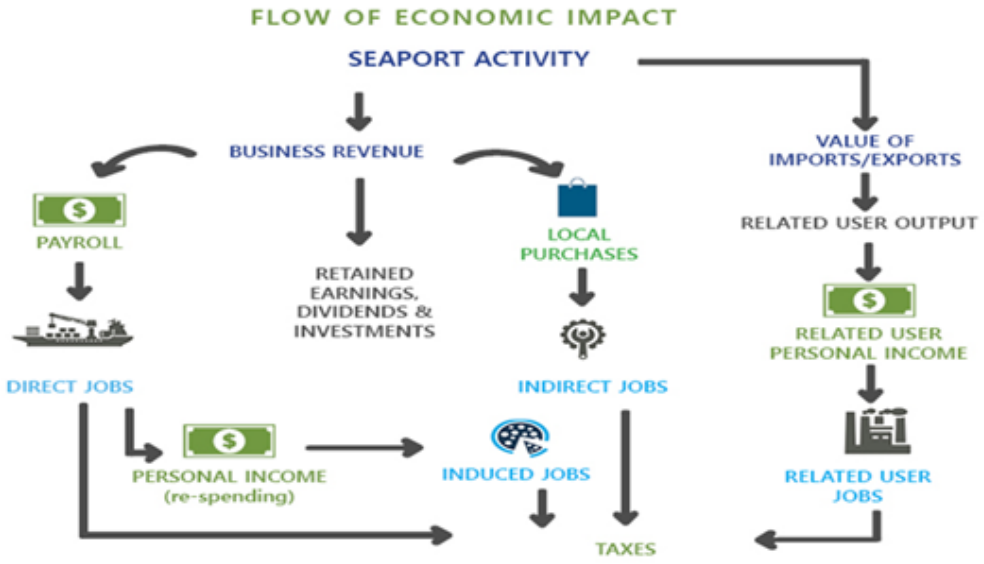
The remainder of this chapter presents an overview of the economic impact analysis and consists of the following sections:

- Flow of economic impacts through the local and regional economies
- The structure of the impact analysis
- Summary of the methodology
- Commodities included in the analysis

1. FLOW OF IMPACTS

Waterborne activity at a seaport contributes to the local and regional economy by generating business revenue to local and national firms providing vessel and cargo handling services at the marine terminals. These firms, in turn, provide employment and income to individuals and pay taxes to state and local governments. Exhibit I-1 shows how activity at marine terminals generate impacts throughout the local, state, and national economies. As this exhibit indicates, the impact of a seaport on a local, state, or national economy cannot be reduced to a single number, but instead, the seaport activity creates several impacts. These are the revenue impact, employment impact, personal income impact and tax impact. These impacts are non-additive. For example, the income impact is a part of the revenue impact and adding these impacts together would result in double counting. Exhibit I-1 shows graphically how activity at the PHA's marine terminals and private marine terminals generate the four impacts.

Exhibit I-1
Flow of Economic Impacts Generated by Marine Activity



1.1 Business Revenue Impact

At the outset, activity at the port generates business revenue for firms which provide services. This business revenue impact is dispersed throughout the economy in several ways. It is used to hire people to provide the services, to purchase goods and services and to make federal, state, and local tax payments. The remainder is used to pay stockholders, retire debt, make investments, or is held as retained earnings. It is to be emphasized that the only portions of the revenue impact that can be definitely identified as remaining in the local economy are those portions paid out in salaries to local employees, for local purchases by individuals and businesses directly dependent on the seaport, in contributions to state and local taxes, in lease payments to the Houston Ship Channel by tenants and wharfage and dockage fees paid by the steamship lines to the terminals located along the Houston Ship Channel.

1.2 Employment Impact

The employment impact of seaport activity consists of four levels of job impacts:

- Direct employment impact – jobs directly generated by seaport activity. Direct jobs generated by marine cargo include jobs with railroads and trucking companies moving cargo between inland origins and destinations and the marine terminals, longshoremen and dockworkers, steamship agents, freight forwarders, stevedores, etc. It is to be emphasized that these are classified as directly generated in the sense that these jobs would experience near term dislocation if the activity at the PHA marine terminals or private terminals were to be discontinued.

- Induced employment impact – jobs created throughout the local economy because individuals directly employed due to seaport activity spend their wages locally on goods and services such as food, housing, and clothing. These jobs are held by residents located throughout the region, since they are estimated based on local and regional purchases.

- Indirect employment impact – jobs created locally due to purchases of goods and services by firms, not individuals. These jobs are estimated directly from local purchases data supplied to Martin Associates by the 986 companies interviewed as part of this study and include jobs with local office supply firms, maintenance and repair firms, parts, and equipment suppliers, etc. It is to be emphasized that special care was taken to avoid double counting, since the current study counts certain jobs as direct (i.e., trucking jobs, jobs with railroads, jobs with insurance companies and admiralty law firms, etc.) which are often classified as indirect by other approaches, notably the input/output

model approach.

- Related jobs are jobs that are determined to be related to physical cargo that is exported and imported via the Houston Ship Channel public and private marine terminals in 2022. These jobs include the portion of jobs at importing and exporting firms that are directly associated with the cargo moved via the Houston Ship Channel marine terminals. See "related user impacts" below for more details.

1.3 Personal Income Impact

The personal income impact is the measure of employee wages and salaries (excluding benefits) received by individuals directly employed due to seaport activity. Re-spending of these earnings throughout the regional economy for purchases of goods and services is also estimated. This, in turn, generates additional jobs – the induced employment impact. This re-spending throughout the region is estimated using a regional personal earnings multiplier, which reflects the percentage of purchases by individuals that are made within the Houston region. The re-spending effect varies by region – a larger re-spending effect occurs in regions that produce a relatively large proportion of the goods and services consumed by residents, while lower re-spending effects are associated with regions that import a relatively large share of consumer goods and services (since personal earnings "leak out" of the region for these out-of-regional purchases). The direct earnings are a measure of the local impact since they are received by those directly employed by seaport activity.

1.4 Tax Impact

Tax impacts are tax payments to the state and local governments by firms and by individuals whose jobs are directly dependent upon and supported (induced and indirect jobs) by activity at the marine terminals.

1.5 Related User Impacts

In addition, the direct, induced, and indirect impacts also support activity with regional exporters and importers using the Houston Ship Channel's public and privately owned marine terminals. These impacts are classified as ***related user impacts*** in that the exporters and importers using the marine terminals can and do use other ports for the shipment and receipt of cargo. The related impacts measure the impact, or influence, of the port's marine terminals at a given point in time and if the port's terminals were no longer used, these influenced users would use other ports to export and import cargo. Unlike the direct, induced, and indirect impacts, the related impacts would not necessarily be dislocated from the economy– instead, the impacts would no longer be influenced by the Houston Ship Channel, but by another port. It is emphasized that only the portion of jobs, income taxes and revenue related to the actual cargo moving via the Houston Ship Channel public and private marine terminals is counted in the related user impacts.

Finally, the direct, induced, and indirect port sector job, income, revenue and tax impacts associated with each of the cargoes for which related shipper/consignee impacts were estimated were subtracted from the total related impacts (by commodity and cargo type). This was done to avoid double counting, as the related shipper/consignee impacts include impacts at each logistical stage of handling the imported and exported cargo, such as the port activity and the trucking and rail activity to move the cargo to and from each port and the induced and indirect jobs associated with the direct port activity.

2. IMPACT STRUCTURE

The four types of economic impacts are created throughout various business sectors of the state and local economies. Specifically, four distinct economic sectors are impacted as a result of activity at the marine terminals. These are the:

- Surface Transportation Sector
- Maritime Services Sector
- Shippers/Consignees using the Port
- Port of Houston Authority

Within each sector, various participants are involved. Separate impacts are estimated for each of the participants. A discussion of each of the economic impact sectors is provided below, including a description of the major participants in each sector.

2.1 The Surface Transportation Sector

The surface transportation sector consists of both the railroad and trucking industries. The trucking firms and railroads are responsible for moving the various cargoes between the marine terminals and the inland origins and destinations.

2.2 The Maritime Services Sector

This sector consists of numerous firms and participants performing functions related to the following maritime services:

- Cargo Marine Transportation
- Vessel Operations
- Cargo Handling
- Federal, State and Local Government Agencies

A brief description of the major participants in each of these four categories is provided below:

- Cargo Marine Transportation - Participants in this category are involved in arranging for inland and water transportation for export or import freight. The freight forwarder/customhouse broker is the major participant in this category. The freight forwarder/customhouse broker arranges for the freight to be delivered between the terminals and inland destinations, as well as the ocean transportation. This function performed by freight forwarders and customhouse brokers is most prevalent for general cargo commodities.

- Vessel Operations - This category consists of several participants. The steamship agents provide a number of services for the vessel as soon as it enters the port; the agents arrange for pilot services and towing, for medical and dental care of the crew and for ship supplies. The agents are also responsible for vessel documentation. In addition to the steamship agents arranging for vessel services, those providing the services include:

  - Chandlers - supply the vessels with ship supplies (food, clothing, nautical equipment, etc.)

  - Towing firms - provide the tug service to guide the vessel to and from port; these firms sometimes are involved in domestic barge operations

  - Pilots - assist in navigating the vessels along the Houston Ship Channel to and from the PHA marine terminals and private marine terminals

  - Bunkering firms - provide fuel to the vessels

  - Marine surveyors - inspect the vessels and the cargo

  - Shipyards/marine construction firms - provide repairs, either emergency or scheduled as well as marine pier construction and dredging

- Cargo Handling - This category involves the physical handling of the cargo at the terminals between the land and the vessel. Included in this category are the following participants:

  - Longshoremen - include members of the International Longshoremen's Association (ILA), as well as non-ILA dockworkers that are involved in the loading and unloading of cargo from the vessels, as well as handling the cargo prior to loading and after unloading.

  - Stevedoring firms - manage the longshoremen and cargo-handling activities.

Stevedoring services at the Houston Ship Channel terminals are provided by private stevedoring companies.

- Terminal operators - are often stevedoring firms who operate the maritime terminals where cargo is loaded and off-loaded.

- Warehouse operators - store cargo after discharge or prior to loading and consolidate cargo units into shipment lots.

- Government Agencies - This service sector involves federal, state, and local government agencies that perform services related to cargo handling and vessel operations at the Port. U.S. Customs, Bureau of Immigration, U.S. Department of Labor, U.S. Department of Agriculture, U.S. Coast Guard, the Army Corps of Engineers, and U.S Department of Commerce employees are involved. These services are provided by the government offices located in the Houston area.

2.3 Banking/Law Sector

While this service sector is not directly involved in cargo or ship operations, it nonetheless does provide services such as financing export/import transactions and insuring cargo and vessels. Also included in this sector are legal firms specializing in maritime law.

2.4 Shippers/Consignees

Two categories of shippers and consignees are considered in the analysis: those that are totally dependent on the public and privately-owned marine terminals and those located throughout the regional economy whose business is only related to the port. Those in the first category would most likely shut down operations if the marine terminals were not available for their use, while those in the second category would ship or receive materials via another port. Related jobs consist of jobs with steel fabrication firms, users and producers and consumers of containerized cargo and break bulk cargo and farmers producing the grain for export. Dependent shippers/consignees include employees of the oil refineries and petrochemical plants that are dependent upon the receipt of crude and chemicals by vessel/barge and the shipment of refined product by vessel/barge, as well as plants on the Houston Ship Channel that are dependent upon the receipt or shipments of steel products and other miscellaneous break bulk cargoes. For this current study, the majority of shippers and consignees are with petrochemical plants, fertilizer operations and petroleum refineries.

2.5 Port of Houston Authority

The Port of Houston Authority (PHA) sector includes those individuals employed by the Port of Houston Authority whose purpose is to oversee port activity at the PHA owned and operated marine terminals, PHA leased marine terminals and other PHA marine terminals.

3. SUMMARY OF METHODOLOGY

The purpose of this section is to provide a summary of the methodological approach used to estimate the economic impacts of the vessel and cargo activity at the public and private terminals at the Houston Ship Channel.

3.1 Data Collection

The cornerstone of the Martin Associates' approach is the collection of detailed baseline impact data from firms providing services at the PHA marine terminals and the private terminals. To ensure accuracy and defensibility, the baseline impact data were collected from interviews with more than 1,100 firms in the Houston maritime community. These firms represent the universe of firms providing services at the public and private marine terminals located along the Houston Ship Channel, as identified by:

- PHA's internal customer and tenant lists
- The Port of Houston, Port Directory
- Prior economic impact studies conducted by Martin Associates for the Port of Houston Authority

3.2 Direct Jobs, Income and Revenue Impacts

The results of these interviews were then used to develop the baseline direct job, revenue and income impacts for the economic sectors and job categories associated with the PHA's marine terminals, as well as the private terminals.

The direct tax impacts are estimated at a state, county and local level based on per capita income tax burdens published by the Tax Foundation and Center Square, as well as data collected from the U.S. Bureau of Census, State and Local Government Finances.

This baseline survey data was also used to develop operational models which can be used to update the impacts of the Houston Ship Channel's marine terminals and private terminals on an annual basis and to evaluate the impacts of changes in:

- Marine cargo tonnage, by commodity
- Seaport labor productivity and work rules
- Modal distribution of seaport cargo (what percent of the inland transportation of a commodity is truck versus rail), as well as the geographical distribution of each commodity
- Vessel calls and vessel size
- New carrier services

Also, the operational models can be used to evaluate alternative facilities expansion projects and new marine terminal construction, as well as the impacts associated with channel dredging and widening.

3.3 Induced Impacts

Induced impacts are those generated by the purchases of the individuals employed as a result of seaport activity. For example, a portion of the personal earnings received by those directly employed due to activity at the marine terminals is used for purchases of goods and services, both regionally, as well as out-of-the region. These purchases, in turn, create additional jobs in the region which are classified as induced. To estimate these induced jobs, a regional personal earnings multiplier was developed from data provided by the Bureau of Economic Analysis, Regional Income Division. This personal earnings multiplier is used to estimate the total personal earnings generated in the Houston area as a result of the activity at the Houston Ship Channel's marine terminals and at private marine terminals. A portion of this total personal earnings impact is next allocated to specific local purchases (as determined from consumption data for Houston residents, as developed from the U.S. Bureau of Labor Statistics, Consumer Expenditure Survey). These purchases are next converted into retail and wholesale induced jobs in the regional economy.

Induced jobs are not estimated at lower levels of purchasing rounds (after the wholesale round) since it is not possible to trace with a sufficient degree of accuracy, geographically, where purchases at the remaining levels occur. However, about 80 percent of the consumption will likely occur at the first two rounds of purchases, which are most likely local retail and wholesale purchases.

3.4 Indirect Impacts

Indirect impacts include indirect jobs, personal income and state and local taxes. These indirect impacts are generated in the local economy as the result of purchases by firms that are directly dependent upon cargo and vessel activity at the marine terminals, including the shippers/consignees located along the Houston Ship Channel. These purchases are for goods and services such as office supplies and equipment, maintenance and repair services, communications and utilities, transportation services and other professional services. To estimate the indirect economic impact, local purchases, by type of purchase, were collected from each of the firms interviewed. These local purchases were then

combined with employment to sales ratios in local supplying industries, developed from the U.S. Bureau of Economic Analysis Regional Input-Output Modeling System for the Houston region. The indirect job ratios also account for the in-state spin-off effects from multiple rounds of supply chains that are required to provide the locally purchased goods and services.

3.5 Related Impacts

Related impacts measure the jobs, income, revenue and state and local taxes with shippers and consignees moving cargo through the PHA's marine terminals and private terminals. These jobs are classified as related jobs since the firms using the marine terminals for the movement of cargo can and do use other seaports and marine terminals. For example, firms importing or exporting containerized cargo typically select a steamship line rather than the seaport through which the cargo will move and the port through which the containerized cargo moves is ultimately determined by the steamship line's port call rotation. Similarly, exporters of breakbulk cargo often use freight forwarders, who in turn choose the port of export. Importers of breakbulk cargo often use several ports for the import of cargo, based on market locations. Because of the proximity of other ports and the associated steamship service at these ports, such as Freeport, Galveston, Corpus Christi, New Orleans, as well as West Coast Ports (competing for the Far East land bridge cargo) to the Houston Ship Channel's marine terminals, importers as well as exporters of containers, break bulk and bulk cargo have some flexibility in port choice. As a result, jobs with these exporters and importers cannot be counted as dependent upon the public and private marine terminals.

These jobs are estimated based on the value per ton of the commodities exported and imported only via the Houston Ship Channel and the associated jobs to value of output ratios for the respective producing and consuming industries located in the state. The value per ton of each of the key commodities moving via the Houston Ship Channel was developed from the U.S. Census Bureau, USA Trade On-Line. The average value per ton for each commodity moving over the PHA and private marine terminals was then multiplied by the respective tonnage moved in 2022. Ratios of jobs to value of output for the corresponding consuming and producing industries were developed by Martin Associates from the U.S. Bureau of Economic Analysis, Regional Input-Output Modeling System for the state of Texas. These jobs to value coefficients include the in-state, spin-off impacts that would occur in order to produce the export commodity or use the import commodity in production. The percentage of each commodity that is produced or consumed in the state of Texas was next developed from the interviews and the value of each commodity remaining in the state of Texas was calculated. The ratios of jobs to value of export or import cargo were then combined with the in-state value of the respective commodities moving via the PHA terminals and private terminals to estimate related jobs and the spin-off jobs in-state to support the export and import industries. Similarly, the respective income and output multipliers were used to estimate the related personal income impact as well as the total value of economic output and taxes generated by the Houston Ship Channel public and private marine terminals. It is to be emphasized that care was taken to control for double counting of the direct, induced, and indirect impacts.

4. COMMODITIES INCLUDED IN THE ANALYSIS

A major use of an economic impact analysis is to provide a tool for port development planning. As a port grows, available land and other resources for port facilities become scarce and decisions must be made as to how to develop the land and utilize the resources in the most efficient manner. Various types of facility configurations are associated with different commodities. For example, containers require a large amount of paved, open storage space, while certain types of dry bulk cargo require covered storage and special dust removing equipment.

An understanding of the commodity's relative economic value in terms of employment and income to the local community, the cost of providing the facilities and the relative demand for the different commodities is essential in making future port development plans. Because of this need for understanding relative commodity impacts, economic impacts are estimated for the following commodities handled at the public and private marine terminals:

- Containerized cargo
- Autos
- RoRo
- Steel products
- Bagged cargoes
- Forest products
- Miscellaneous break bulk
- Fertilizer
- Dry bulk
- Grain
- Liquid bulk
- Petroleum

It should be emphasized that commodity-specific impacts are not estimated for each of the economic sectors described in the last section. Specific impacts by commodity could not be allocated to individual commodities with any degree of accuracy for the banking/insurance/law sector and marine construction sector. In addition, taxes have not been displayed by specific commodities since these tax impacts will reflect the same distribution over commodities as the employment impact.

II. EMPLOYMENT IMPACTS

In this chapter, the employment generated by maritime activity at the public and private marine terminals along the Houston Ship Channel is estimated. The chapter is organized as follows:

- First, the total employment that is in some way related to the activities at the public and private marine terminals is estimated.

- Second, the subset of total employment that is judged to be totally dependent (i.e., direct jobs) on port activity is analyzed as follows:

  - The direct job impact is estimated in terms of key economic sectors, i.e., surface transportation sector, maritime services sector, shippers/consignees' sector, and Port of Houston Authority sector.

  - The direct job impact is estimated by detailed job category, i.e., trucking, ILA/dockworkers, freight forwarders/customhouse brokers, steamship agents, chandlers, warehousemen, stevedores and terminal operators, surveyors, etc.

  - The direct job impact is estimated for each of the key commodities/commodity groups.

  - The direct job impact is estimated based on the residency of those directly employed.

- Induced and indirect jobs are estimated.

- Finally, jobs related to marine activity at the public and private marine terminals are described.

1. TOTAL EMPLOYMENT IMPACT

It is estimated that 1,540,417 Texas jobs are in some way related to port activities at the public and private marine terminals along the Houston Ship Channel. Of the 1,540,417 jobs held by Texas residents:

- 78,308 jobs are directly generated by activities at the public and private marine terminals and if such activities should cease, these jobs would be discontinued over the short term.

- 138,161 jobs (induced jobs) are supported by the local purchases of the 78,308 individuals directly generated by port activity at the marine terminals. An additional 68,787 indirect jobs were generated due to $7.2 billion of purchases in the local and regional economy by firms providing direct cargo handling and vessel services and by the directly dependent shippers/consignees located along the Houston Ship Channel.

- An additional 1,255,160 Texas jobs are with exporters and importers located in Texas that ship cargo via the public and private marine terminals. These jobs are estimated based on the actual volume and value of the containerized cargo, break bulk cargo and dry and liquid bulk cargo moving via the Houston Ship Channel marine terminals. These jobs are considered to be related to activities at the public and private marine terminals, but the degree of dependence on these terminals is difficult to estimate. It is to be emphasized that the level of employment with these exporters and importers is based on the demand for the final product, i.e., imported retail commodities such as electronics and computer equipment, not by the actual use of the marine terminals along the Houston Ship Channel. However, if other ports were used, it is likely that the costs of importing and exporting would increase, which could have long run implications on the level of employment with the related shippers/consignees. Finally, it is to be emphasized that there is no double counting of the directly dependent shippers/consignees in this related job estimate.

2. DIRECT JOB IMPACTS

In 2022, 256.8 million tons of domestic and foreign waterborne cargo moved via the public and private marine terminals[3]. As a result of this activity, 78,308 full-time jobs were directly created[4]. In this section the jobs are analyzed in terms of:

- Distribution by economic sector
- Distribution by job category
- Distribution by commodity group
- Distribution by county and state of residency

[3] Total tonnage is estimated based on actual 2022 tonnage data at the Houston Ship Channel terminals. For the domestic and international cargo handled at the private terminals, a combination of sources was used to estimate the 2022 tonnage, including interviews with the private terminals; a review of the U.S. Army Corps of Engineers, Waterborne Commerce Statistics (2020 data for domestic trade which is latest published); S&P Transearch data for domestic waterborne shipments and receipts; and 2022 USA Trade OnLine, U.S. Bureau ofCensus.

[4] Jobs are measured in terms of full-time worker equivalents. If a worker is employed only 50 percent of the time by activity at the Houston Ship Channel public and private marine terminals, then this worker is counted as 0.5 jobs.

2.1 Job Impacts by Sector and Job Category

Exhibit II-1 presents the distribution of the 78,308 direct jobs by sector and job category. As this exhibit shows, the largest job impacts are with shippers and consignees dependent upon the cargo moving via the terminals along the Houston Ship Channel. These jobs are concentrated with the refineries and petrochemical facilities moving the liquid bulk cargoes through the marine terminals. Of the 9,273 terminal and dockworkers workers, about 4,100 were members of International Longshormen's Association (ILA). About 80 percent of the ILA jobs were employed by handling containerized cargo, followed by the handling of steel products. About 45 percent of the terminal jobs excluding the ILA are employed by the marine terminal operations of petrochemical plants and refineries. The majority of warehousing jobs is created by containerized cargo and includes jobs with container freight station operations, container repair operations, transload operations and distribution centers dependent on import and export containers moving via the port's marine terminals.

Exhibit II-1
Direct Employment Impacts by Job Category

JOB CATEGORY	PHA	PRIVATE	TOTAL
SURFACE TRANSPORTATION			
Rail	251	672	923
Truck	7,056	5,891	12,947
MARITIME SERVICES			
Terminal/ILA/Dockworkers	5,841	3,432	9,273
Tug Assist	58	145	203
Pilots	39	97	136
Agents	1,017	357	1,374
Maritime Services	680	4,219	4,899
Forwarders	1,664	407	2,071
Warehouse/Container Repair	3,880	385	4,265
Marine Construction/Ship Repair	840	773	1,613
Government	51	462	514
Linehaul Barge/Bunkering	258	1,239	1,497
DEPENDENT SHIPPERS/CONSIGNEES	7,529	27,708	35,237
BANKING/ADMIRALTY LAW	261	2,360	2,621
PORT OF HOUSTON AUTHORITY	735		735
TOTAL	30,161	48,148	78,308

Totals may not add due to rounding

2.2 Direct Job Impacts by Commodity

Most of the 78,308 jobs considered to be generated by port activity can be related to the handling of specific commodities or commodity groups. Certain employment categories such as

government employees, employees with marine construction and ship repair, banking and admiralty law firms and the miscellaneous maritime services firms cannot be identified with a specific commodity. As a result, employment in these groups (which totaled 8,662 jobs) was not allocated to commodity groups.

Exhibit II-2 presents the direct employment impacts in terms of commodity groups. This exhibit indicates that in 2022, liquid bulk handled at the private terminals generated the largest number of direct jobs, 65,542. The majority of these jobs are with refineries and petrochemical facilities along the Houston Ship Channel directly dependent upon the shipment and receipt of petroleum and petrochemicals via the Houston Ship Channel. The movement of containerized cargo accounting for 18,564 direct jobs. The majority of these jobs are with trucking; warehouse/container repair and CFS operations; members of the International Longshoremen's Association; and dependent shippers/consignees. The import of steel products generated 3,879 direct jobs, the majority of the jobs were generated with terminal operations/ILA/dockworkers; dependent shippers/consignees; trucking firms; and freight forwarders. Miscellaneous break bulk cargo generated 2,227 direct jobs, the majority of which are with warehousing, trucking, forwarding and the ILA. Autos, RoRo, and project cargo such as wind energy components created 1,199 direct jobs, the majority with terminal operators and processors and shippers/consignees handling heavy equipment, agricultural and road working machinery.

Exhibit II-2
Distribution of Direct Job Impact by Commodity

COMMODITY TYPE	TOTAL JOBS
Containers	18,564
Autos/RoRo	1,199
Steel	3,879
Bagged Cargoes	294
Forest Products	401
Miscellaneous Break Bulk	2,227
Bulk Grain	453
Other Dry Bulk	1,883
Liquid Bulk	65,542
Not Allocated	8,662
Total	78,308

Totals may not add due to rounding

2.3 Job Impacts per Ton

The assessment of the job impacts on a per 1,000 ton basis provides a tool for port planners to use in evaluating the relative importance of different commodities as economic generators. Exhibit II-3 presents the job impacts per 1,000 tons for each commodity moving via the public and private marine terminals.

Exhibit II-3
Job Impacts per 1,000 Tons

COMMODITY TYPE	JOBS/1000 TONS
Containers	0.53
Autos/RoRo	2.58
Steel	0.58
Bagged Cargoes	0.66
Forest Products	0.48
Miscellaneous Break Bulk	1.16
Bulk Grain	0.08
Other Dry Bulk	0.29
Liquid Bulk	0.33

The movement of automobiles and RoRo cargo such as agricultural equipment, project cargo and road working equipment generates the greatest number of direct jobs per 1,000 tons, followed by the movement of break bulk cargo and bagged cargo.

Despite the fact that petroleum and petroleum products generated the largest direct job impact, on a per 1,000-ton basis, crude petroleum and petrochemicals generated 0.33 jobs per 1,000. The finding that the liquid bulks and dry bulk cargoes, including bulk grains, generate a relatively small number of direct jobs per 1,000 tons of throughput reflects the fact that the handling of bulk cargoes is much less labor intensive than handling RoRo and automobiles, steel, bagged cargo, palletized and containerized cargo. Also, the supporting infrastructure of freight forwarders and customhouse brokers, warehousing and terminal operators is much greater for one ton of general cargo moved than for the one ton of dry and liquid bulk cargoes.

It is important to emphasize that these jobs per 1,000-ton ratios are static ratios and should not be used to extrapolate increases in tonnage into increases in direct jobs. The relationship between tonnage increases and jobs is not linear, since certain jobs are fixed with respect to waterborne tonnage.

To estimate changes in direct jobs due to tonnage changes, the Martin Associates' Houston Ship Channel Impact model should be used, as this is the designed purpose of the model.

2.4 Distribution of Direct Jobs by Place of Residence

To underscore the geographic scope of the impacts generated by the public and private marine terminals, Exhibit II-4 presents the distribution of the 78,308 direct jobs by place of residence. The residence analysis is based on the results of the interviews with the service providers. As this exhibit indicates, 72 percent of the direct jobs are held by residents of Harris County, including Houston, Pasadena, La Porte, and other communities in that county. About 6 percent of the direct jobs are held by residents of Brazoria County.

Exhibit II-4
Distribution of Direct Jobs by Place of Residency

JURISDICTION	SHARE	DIRECT JOBS
HARRIS COUNTY	**71.85%**	**56,266**
Houston	24.05%	18,835
Pasadena	2.03%	1,594
LaPorte	1.20%	942
Baytown	0.78%	610
Seabrook	0.22%	175
Deer Park	0.80%	630
Galena Park	0.10%	78
Channelview	0.23%	182
Other Harris County	42.42%	33,220
BRAZORIA COUNTY	**5.78%**	**4,530**
CHAMBERS COUNTY	**0.87%**	**678**
FORT BEND COUNTY	**2.00%**	**1,565**
GALVESTON COUNTY	**4.98%**	**3,901**
MONTGOMERY COUNTY	**3.62%**	**2,835**
OTHER TEXAS	**5.71%**	**4,472**
OTHER US	**5.19%**	**4,062**
TOTAL	**100.00%**	**78,308**

Totals may not add due to rounding

3. INDUCED JOBS

The 78,308 directly employed individuals due to activity at the public and private marine terminals received wages and salaries, a part of which was used to purchase local goods and services such as food, housing, clothing, transportation services, etc. As a result of these local purchases, 138,161 jobs in the regional economy were supported. The majority of the induced jobs are with state and local government agencies providing school, health care, police and fire protection, other community and social services, as well as firms providing business and personal services. The next largest induced job impact occurs in the local food industry (restaurant and groceries), where more than 27,000 jobs are supported.

4. INDIRECT JOBS

In addition to the induced jobs generated by the purchases of 78,308 directly employed individuals, the firms providing the direct services and employing the 78,308 direct jobs make local purchases for goods and services. These local purchases by the firms dependent upon the public and private marine facilities generate additional local jobs – indirect jobs. Based on interviews with the port service providers and terminal operators, these firms made $7.2 billion of local purchases in 2022. These direct local purchases created an additional 68,787 indirect jobs in the local economy. These purchases include expenditures for equipment and parts, maintenance and repair services, office supplies, raw materials, fuel, and utilities. Care is taken to avoid any double counting of jobs already included in direct jobs.

5. RELATED JOBS

It is estimated that about 1,255,160 jobs with Texas companies using the port to ship and receive waterborne cargo are classified as related to the public and private marine terminals. These jobs are with importers of steel, producers and consumers of containerized cargo and break bulk cargo, producers and consumers of the liquid and dry bulk cargoes moving through the public and private marine terminals and farmers producing grain and rice for export.

To estimate the related user jobs with importers/exporters and those industries supporting the production of the container exports and the consumers of the containerized imports moving via Houston Ship Channel container terminals, the following methodology was used. First, the key cargoes within the containers moving via the Houston Ship Channel were identified from USA Trade OnLine. The majority of imported containerized cargo consists of electronics, beverages, iron and steel products and chemicals. For export containers, key commodities include plastics, chemicals and machinery and equipment. The average value per ton of each commodity was also developed from the USA Trade OnLine database. The average value per ton of containerized cargo imports and exports handled at the port was then estimated.

Export producing industries were identified for the key commodities moving in the export containers via the port's container terminals. Similarly, the cargo moving in the imported containers was also associated with the producing industries or retail/wholesale activity. Using the Bureau of Economic Analysis, RIMS II model for the state of Texas, jobs to value of output ratios were developed for the relevant export producing and import consuming sectors. For imported goods associated with wholesale operations, the average wholesale margins were applied to the value of the imported containerized cargo associated with wholesale operations. The values of import and export containers moving via the port were next estimated by multiplying the value per container (export and import separately) by the number of full containers moved via the container terminals. The total values of each type of container moved via the port were then adjusted to reflect the percentage of containers originating or destined for Texas, as determined from the terminal operators and steamship lines.

About 85 percent of the containerized cargo imported and exported via the Houston Ship Channel is estimated to originate or be consumed in Texas. Combining this share with the value of export and import containers and the relevant jobs to value of shipment ratios, it is estimated that about 486,000 jobs are with in-state users of the Houston Ship Channel for the shipment and receipt of containerized cargo. Included in this related job estimate are not only the jobs with the importers and exporters and the induced and indirect jobs created by these jobs, but the jobs required to support the production of the exports as well as the distribution and use of the imports are also included in the related user job impacts. A similar method was used to estimate jobs related to forest products, grain and liquid and dry bulk cargoes. The impact of imported steel in the local construction industry was estimated in a similar method, combining the value of the imported steel via the port that is estimated to remain in Texas (determined through terminal interviews) with the construction employment to output coefficient developed from the U.S. Bureau of Economic Analysis.

It is to be emphasized that these are related jobs and would not likely disappear if the marine terminals along the Houston Ship Channel were to close to marine cargo activity. Given a level of demand for the steel, containerized cargo, export grain and breakbulk commodities (mostly manufactured cargo), the cargo would be shipped through another port such as Galveston, Corpus Christi, New Orleans or Los Angeles/Long Beach. The directly dependent shipper/consignee impacts, as well as direct, induced, and indirect jobs are not included in these related job estimates.

It is to be further emphasized that when the impact models are used for planning purposes, related jobs should not be used to judge the economic benefits of a particular project. Related jobs are not estimated with the same degree of defensibility as are the direct, induced, and indirect jobs. Therefore, these three types of job impacts should be used in evaluating port investments. The purpose of the related jobs estimates is to provide a proxy for the magnitude of the more general economic development impact of the private and public port facilities at a specific point in time. It is the ultimate demand for the products moving via the Houston Ship Channel that <u>generates</u> the impacts with the related users.

III. REVENUE, INCOME, AND TAX IMPACTS

The 256.8 million tons of cargo at the Houston Ship Channel's private and public marine terminals generated revenue for firms in each of the economic sectors. For example, revenue is received by the railroads and the trucking companies within the surface transportation sector as a result of moving export cargo to the marine terminals and distributing the imported commodities inland after receipt at the marine terminals. The firms in the maritime services sector receive revenue from arranging for transportation services, cargo handling, providing services to vessels in port and repairs to vessels calling the port facilities. The banking/insurance sector receives revenue from financial services provided to users of the marine terminals. The Houston Ship Channel Authority receives revenue from terminal leases and port charges such as wharfage and dockage assessed on cargo and vessels calling on the public terminals. In addition, revenue is received by shippers/consignees from the sales of cargo shipped or received via the marine cargo terminals and from the sales of products made with raw materials received through the terminals. Since this chapter is concerned with the revenue generated from providing maritime services, the shipper/consignee revenue (i.e., the value of the cargo shipped or received through the marine terminals) will be excluded from the remaining discussion.

The revenue generated by port activity consists of many components. For example, gross revenue is used to pay employee salaries and taxes, it is distributed to stockholders of the companies providing the vessel and cargo handling services and it is used for the purchases of equipment and maintenance services. Of these components, only three can be isolated geographically with any degree of accuracy. These are the personal income component of revenue, which can be traced to geographic locations based on the residence of those receiving the income, the payment of state and local taxes and the local purchases made by firms dependent upon the maritime activity. The balance of the revenue is distributed in the form of payments to firms located outside the Houston region providing goods and services to the maritime sectors and for the distribution of company profits to shareholders.

Since it is difficult to trace all the components of the revenue beneficiaries, an estimate of revenue is developed, but no conclusions are formulated as to how the revenue (other than personal income, taxes and local purchases) is distributed, geographically. It is more accurate to trace the distribution of personal income (which is a subset of revenue) through the geographic locations of individuals receiving the income.

1. REVENUE IMPACT - TOTAL ECONOMIC ACTIVITY

In 2022, marine cargo activity at the public and private marine terminals along the Houston Ship Channel supported a total of $439.2 billion of total economic value in the state of Texas. Of the $439.2 billion, $29.6 billion is the direct business revenue received by the firms directly dependent upon the port and providing maritime services and inland transportation services to the cargo handled at the marine terminals and the vessels calling the port, as well as ship and rig repair and maintenance services. An additional $389.3 billion represents the value of the output to the state of Texas that is created due to the cargo moving via the Houston Ship Channel public and private marine terminals. This includes the value added at each stage of producing an export cargo, as well as the value added at each stage of production for the firms using imported raw materials and intermediate products that flow via the marine terminals and are consumed within the state. The majority of these user impacts are associated with the imported steel products receipts. In addition, $20.3 billion of the re- spending of personal income and local consumption purchases are supported in the local and regional economy. These components are additive and represent independent monetary impacts supported by the cargo and vessel activity. Other dollar value impact measures are not included in the total economic value since they are interdependent. Direct income is not included since it is part of the direct business impact and similarly, local purchases by the firms are from the direct business revenue generated by port activity used to pay indirect income. Finally, taxes are paid by the individuals from the direct, induced, indirect and related income and the direct business revenue and the related output.

The balance of this section focuses only on the $29.6 billion revenue impact generated from the provision of transportation services in support of the cargo and vessel activity at the Houston Ship Channel. It is important to emphasize that the direct business revenue does not include the value of the cargo moving via the marine facilities.

1.1 Direct Revenue Impacts by Economic Sector

In 2022, the cargo and vessel activity at the Houston Ship Channel's public and private marine terminals generated $29.6 billion of business revenue to the firms providing cargo handling and vessel services and supporting the firms directly dependent upon the Houston Ship Channel.

1.2 Direct Revenue Impacts by Economic Sector and Job Category

Exhibit III-1 presents the distribution of the $29.6 billion of directly generated revenue across the various port sectors and job categories. This revenue includes the revenue received by firms providing services to the commodity and vessel activity at the PHA owned, leased, and operated terminals and private terminals and includes revenue received by trucking firms, stevedores, the Port of Houston Authority, chandlers, vessel agents, pilots, towing companies, banking/insurance/law firms, etc.

Exhibit III-1
Revenue by Sector and Category

JOB CATEGORY	TOTAL
SURFACE TRANSPORTATION	
Rail	$893
Truck	$2,318
MARITIME SERVICES	
Terminal	$3,446
Tug Assist	$196
Pilots	$152
Agents	$34
Maritime Services	$1,113
Forwarders	$471
Warehouse/Container Repair	$1,091
Marine Construction/Ship Repair	$694
Linehaul Barge/Bunkering	$305
DEPENDENT SHIPPERS/CONSIGNEES	$17,823
BANKING/ADMIRALTY LAW	$370
PORT OF HOUSTON AUTHORITY	$651
TOTAL	$29,557

Totals may not add due to rounding

The majority of the direct revenue is received by the dependent shippers/consignees, followed by the maritime services sector. Within this sector, the terminal operators generated the largest impact, $3.5 billion, consisting of terminal operating revenue as well as revenue from pipeline operations on the terminal site.

1.3 Direct Revenue by Commodity

Exhibit III-2 shows the total revenue impact by commodity. The exhibit shows that in terms of total revenue, liquid bulk creates the largest revenue impact, followed by containers, other dry bulk and miscellaneous break bulk.

Exhibit III-2
Revenue Impacts by Commodity

COMMODITY TYPE	TOTAL REVENUE (MILLIONS$)
Containers	$5,135
Autos/RoRo	$299
Steel	$618
Bagged Cargoes	$51
Forest Products	$68
Miscellaneous Break Bulk	$727
Bulk Grain	$205
Other Dry Bulk	$905
Liquid Bulk	$19,185
Not Allocated	$2,365
Total	$29,557

Totals may not add due to rounding

Note: The revenue per commodity excludes the revenue estimated for banking/insurance/law, maritime services marine construction, ship repair and Port of Houston Authority, which has not been allocated to the commodity groups. This revenue is included in the not allocated category.

Exhibit III-3 shows total direct business revenue generated per ton of cargo. In terms of per ton revenue, RoRo and automobiles generate the largest revenue per ton, as the result of the relatively high transportation cost per vehicle and machinery piece and the labor-intensive loading, discharge, processing and pre-staging required for export and import of RoRo and high and heavy cargo. Miscellaneous break bulk cargo also generates relatively high direct business revenue per ton. On a per container basis, containerized cargo generates about $2,201 per container move. This includes terminal charges, surface transportation, tugs, pilotage, forwarding and CFS operations, as well as revenue received by the dependent shippers/consignees. Dry bulk cargo generates a relatively high revenue per ton impact for bulk cargo, primarily because of the large percentage of dry bulk cargo moving by rail at the Houston Ship Channel. The relatively high revenue per ton for liquid bulk reflects the revenue generated with dependent shippers/consignees.

Exhibit III-3
Direct Business Revenue per Ton

COMMODITY TYPE	REVENUE PER TON
Containers	$145.66
Autos/RoRo	$642.12
Steel	$92.40
Bagged Cargoes	$116.10
Forest Products	$80.75
Miscellaneous Break Bulk	$377.48
Bulk Grain	$36.39
Other Dry Bulk	$141.03
Liquid Bulk	$132.33

2. PERSONAL EARNINGS IMPACT

In the previous section of this chapter, the total revenue generated by port activity was identified. As described earlier, the personal income received by those directly dependent upon port activity along the Houston Ship Channel is paid from the business revenue received by the firms supplying direct services at the marine terminals.

The income impact is estimated by multiplying the average annual earnings (excluding benefits) of each port participant, i.e., truckers, steamship agents, pilots, towing firm employees, longshoremen, warehousemen etc., by the corresponding number of direct jobs in each category. The individual annual earnings in each category multiplied by the corresponding job impact resulted in the $6.5 billion direct personal income (wage and salary earnings) impact.

The impact of the re-spending of this direct income for local purchases is estimated using a personal earnings multiplier. The personal earnings multiplier is based on data supplied by the Bureau of Economic Analysis (BEA). The BEA estimates that for every one dollar earned by direct employees generated by activity at the marine terminals, an additional $3.1048 of personal income and consumption expenditures would be created as a result of re-spending the income for purchases of goods and services produced locally. Hence, a personal earnings multiplier of 4.1048 was used to estimate the additional consumption and income impact due to re-spending – $20.3 billion. This additional re-spending of the direct income generates the 138,161 induced jobs, described in the previous chapter.[5]

[5] It is to be emphasized that the re-spending impact of $20.3 billion does not represent the earnings of the 138,161 induced jobs.

In addition to the direct and induced personal income and consumption impact, wages and salaries were received by the 68,787 indirect employees. Using wage and salary data for these indirect employees as reported by the U.S. Bureau of Economic Analysis, RIMS II, it is estimated that $2.8 billion of indirect wages and salaries were created by port activity. Therefore, in 2022, the maritime activity at the Houston Ship Channel created a total of $29.7 billion of direct, induced, and indirect wages and salaries.

In addition, the related job holders received $92.5 billion of personal wages and salaries.

3. LOCAL PURCHASES

Each of the firms surveyed were asked to provide a breakdown of local expenditures for equipment, parts, office supplies, business services, utilities, raw materials, maintenance and repair, new construction, etc. Based on the reported expenditures, it is estimated that $7.2 billion of local purchases were made by the firms directly dependent upon maritime cargo activity at the Houston Ship Channel's public and private marine terminals. These firms also include the refineries and petrochemical firms located along the Houston Ship Channel that ship and receive cargo by barge or vessel. These $7.2 billion of local purchases in turn supported the 68,787 indirect jobs in the state of Texas.

4. TAX IMPACTS

State and local tax impacts are based on state and local per capita income tax burdens developed by the Tax Foundation, Center Square and the U.S. Bureau of Census State and Local Government Finances. The taxes include all state and local taxes collected in the state of Texas. Multiplying the tax/capita income burden to the total direct, induced, and indirect personal income impact, it is estimated that activity at the PHA-owned or leased marine terminals and the private terminals generated nearly $2.6 billion of state, county, and local taxes. Of the $2.6 billion impact, the state of Texas received $1.1 billion, while the local governments received $1.5 million.

In addition, the $8.0 billion of state and local taxes were generated by the users of the Houston Ship Channel, of which the state of Texas received $3.5 billion and local governments received $4.5 billion.

The $20.3 billion re-spending impact includes direct earnings received by the employees holding the induced jobs, but the re-spending impact also includes the revenue received by firms providing the goods and services to those directly employed.

IV. ECONOMIC IMPACTS OF THE HOUSTON SHIP CHANNEL MARINE TERMINALS

In this chapter the economic impacts generated by the Port of Houston Authority owned, leased, and operated marine terminals and other PHA related marine terminals are detailed. These impacts are a subset of the port-wide (public and private marine terminals) discussed in the previous chapters. The impacts discussed in this chapter are the jobs, revenue, personal income, and taxes generated by the Port of Houston Authority terminals, including Houston Public Grain Elevator #2, Fentress Bracewell Barbours Cut Container Terminal, Bayport Container Terminal, Bulk Materials Handling Plant, Jacintoport, Care Terminal, the PHA Terminals in the Houston Turning Basin and the Woodhouse Terminal. In previous economic impact studies, the liquid bulk tonnage handled at the Bayport Chemical Complex are included with PHA tonnage. This inclusion in previous economic impact studies reflected a relationship between the Bayport Chemical Complex and the PHA. However, since the 2011 Economic Impact Study, this relationship with the PHA no longer exists and the liquid bulk tonnage handled at the Bayport Chemical Complex is now included with the private marine terminals within the Houston Ship Channel.

The same methodology has been used to estimate these PHA impacts as was used to estimate the total port-wide impacts of both public and private terminals, as discussed in the previous chapters. It is useful to have a separate estimate of the impacts generated by public port facilities, as these impacts can be used to demonstrate the value of public investment in port facilities. The resulting economic impact model can be used in port planning decisions, in evaluating capital projects and terminal expansions, as well as in justifying investment decisions.

In 2022, about 55.1 million tons of cargo moved over the PHA-owned or leased terminals located along the Houston Ship Channel. Exhibit IV-1 presents the tonnage by commodity and handling type. The primary commodities handled at the PHA-owned or leased terminals are containerized cargo, liquid bulk cargo, dry bulk cargo liquid bulk cargo, steel products and grain.

Exhibit IV-1
Tonnage at Port of Houston Authority Terminals

COMMODITY TYPE	2022 PHA 1,000 TONS
Containers	34,951
Autos/RoRo	182
Steel	5,203
Break Bulk Cargo	1,592
Bulk Grain	1,908
Bulk	11,226
Total	55,061

Totals may not add due to rounding

The economic impacts generated by the cargo moving via the PHA- owned or leased terminals are summarized in Exhibit IV-2.

Exhibit IV-2
Summary of Texas Impacts Generated by PHA-Owned or Leased Marine Terminals

	PHA Terminals
JOBS	
Direct	30,161
Induced	52,705
Indirect	26,494
Subtotal	*109,360*
Related	870,135
Total	979,495
PERSONAL INCOME(MILLIONS)	
Direct	$2,494
Re-spending/Local Personal Consumption	$7,743
Indirect	$1,071
Subtotal	*$11,308*
Related	$69,990
Total	$81,298
TOTAL ECONOMIC VALUE (MILLIONS)	
Direct Business Revenue	$9,036
Re-spending/Local Personal Consumption	$7,743
Related Output	$245,175
Total Economic Value	$261,953
LOCAL PURCHASES (MILLIONS)	$2,774
STATE/LOCALTAXES (MILLIONS)	
Direct	$217
Induced	$674
Indirect	$93
Subtotal	*$984*
Related	$6,089
Total	$7,073

Totals may not add due to rounding

1. EMPLOYMENT IMPACTS

In total, 979,495 jobs in Texas are in some way related to the 41 million tons of cargo moving via the PHA marine terminals. It is to be emphasized that these 979,495 jobs in Texas are a subset of the 1,540,417 total jobs in Texas in some way related to cargo moving over all marine terminals along the Houston Ship Channel.

Of the 979,495 total jobs in Texas associated with the PHA- owned and leased marine terminals, 30,161 direct jobs were generated by the cargo handled at PHA terminals. As the result of purchases by these 30,161 direct jobs, an additional 52,705 induced jobs were supported in the local economy. Local purchases totaling $2.8 billion by firms dependent upon the maritime activity at the PHA terminals generated an additional 26,494 indirect jobs. An additional 870,135 related jobs in Texas are also associated with the movement of containers, steel, break bulk cargo, autos, liquid bulk cargo, etc. via the public terminals.

In the remainder of this section the direct employment impact is discussed in terms of job category and commodity.

1.1 Direct Job Impacts by Job Category

Exhibit IV-3 shows that 47.5 percent of these 30,161 direct jobs are with maritime services sector firms. The majority of the marine service sector jobs are with warehousing/CFS operations, dockworkers/ILA, terminal and stevedoring operations, freight forwarders and jobs in maritime services. The majority of the warehousing impacts and impacts with the ILA are generated by containerized cargo.

About 19.4 percent of the 30,161 direct jobs are held by terminal employees, dockworkers, and members of the ILA. Within the surface transportation sector, the majority of the direct jobs are held by trucking companies. About 80 percent of the 7,056 trucking jobs are generated by the movement of containerized cargo to and from the PHA terminals, as well as to and from CFS and warehouse locations. This trucking impact also includes drayage impacts between the marine terminals and railyards.

Another 25 percent of the direct PHA generated jobs are with the dependent shippers/consignees using the PHA-owned, operated and/or leased terminals, while about 3 percent of the PHA impact is with the Port of Houston Authority.[6]

[6] The Port of Houston Authority employees do not include casual ILA labor hired by the PHA for terminal work. These ILA members are included with Terminal Operator/ILA/Dockworkers category.

Exhibit IV-3
Direct Jobs by Category Generated by Cargo at PHA-Owned or Leased Marine Terminals

JOB CATEGORY	PHA
SURFACE TRANSPORTATION	
Rail	251
Truck	7,056
MARITIME SERVICES	
Terminal/ILA/Dockworkers	5,841
Tug Assist	58
Pilots	39
Agents	1,017
Maritime Services	680
Forwarders	1,664
Warehouse/Container Repair	3,880
Marine Construction/Ship Repair	840
Government	51
Linehaul Barge/Bunkering	258
DEPENDENT SHIPPERS/CONSIGNEES	7,529
BANKING/ADMIRALTY LAW	261
PORT OF HOUSTON AUTHORITY	735
TOTAL	30,161

Totals may not add due to rounding

1.2 Direct Job Impacts by Commodity Group

Exhibit IV-4 shows the direct jobs by commodity. Containerized cargo generated 18,396 direct jobs. About 30 percent of these jobs directly generated by containerized cargo are with trucking firms, about 18 percent are with the ILA and 12.5 percent are with warehousing, CFS and container repair operations. The handling of steel at the PHA terminals created 3,045 direct jobs, the majority concentrated with dependent shippers/consignees, followed by terminal workers and members of the ILA.

Exhibit IV-4
Distribution of Direct Jobs by Commodity Group – PHA Owned, Leased, Operated Marine Terminals

COMMODITY TYPE	PHA JOBS
Containers	18,396
Autos/RoRo	917
Steel	3,045
Bagged Cargoes	294
Forest Products	305
Miscellaneous Break Bulk	936
Bulk Grain	190
Other Dry Bulk	1,215
Liquid Bulk	2,657
Not Allocated	2,205
Total	30,161

Totals may not add due to rounding.

2. REVENUE IMPACT - TOTAL ECONOMIC ACTIVITY

In 2022, marine cargo activity at the PHA owned and leased public marine terminals supported a total of $261.9 billion of total economic value in the state of Texas. Of the $261.9 billion, $9.0 billion is the direct business revenue received by the firms directly dependent upon the port and providing maritime services and inland transportation services to the cargo handled at the marine terminals and the vessels calling the port, as well as ship and rig repair and maintenance services. An additional $245.2 billion represents the value of the output to the state of Texas that is created due to the cargo moving via the Port of Houston Authority's marine terminals. This includes the value added at each stage of producing an export cargo, as well as the value added at each stage of production for the firms using imported raw materials and intermediate products that flow via the marine terminals and are consumed within the state. In addition, $7.7 billion of personal income re-spending and local consumption are included in this total economic value supported by the Port of Houston Authority cargo activity.

The focus of this section is on the $9.0 billion direct revenue impact generated from the provision of transportation services in support of the cargo and vessel activity at the Port of Houston Authority's marine terminals.

Exhibit IV-5 shows the revenue generated by commodities handled at the PHA-related terminals. Containerized cargo generated the largest revenue impact, nearly $5.1 billion.

Exhibit IV-5
Business Revenue Generated by PHA-Owned or Leased Terminals

COMMODITY TYPE	PHA REVENUE (MILLIONS)
Containers	$5,092
Autos/RoRo	$199
Steel	$481
Bagged Cargoes	$51
Forest Products	$51
Miscellaneous Break Bulk	$193
Bulk Grain	$69
Other Dry Bulk	$643
Liquid Bulk	$1,231
Not Allocated	$1,025
Total	$9,036

Totals may not add due to rounding

3. PERSONAL EARNINGS IMPACT

The 30,161 direct employees received $2.5 billion of wages and salary earnings. Based on the re-spending impact described in the previous chapter, it is estimated that an additional $7.7 billion of local income and purchases were created, supporting the 52,705 induced jobs in the local economy. The 26,494 indirectly employed workers supported by the purchases made by the firms' dependent upon the PHA-owned or leased facilities received $1.1 billion of wages and salaries. In total, the cargo activity at the PHA terminals created $11.3 billion of direct, indirect, and induced wages and salaries and local consumption expenditures in the Houston regional economy. The 870,135 related users received another $70.0 billion of wages and salaries.

4. STATE AND LOCAL TAXES

The activity at the PHA- owned or leased marine terminals generated $984 million of state and local taxes. The state of Texas received $433.0 million in tax revenue from cargo activity at the PHA terminals and the local governments received $551.0 million in tax revenue from PHA activity. In addition, $6.1 billion of state and local taxes were created by the users of the Port of Houston Authority's marine terminals, the state received $2.7 billion, and the local governments received about $3.4 billion in tax revenue.

V. COMPARISON WITH 2018 ECONOMIC IMPACTS

Between 2018 and 2022, total cargo handled at the public and private terminals along the Houston Ship Channel declined by 7.1 million tons. The loss of cargo was concentrated with liquid and dry bulk cargo, most notably a loss of petroleum exports and imports from 2018 levels, as well as a lower volume of steel imports in 2022 compared to 2018 levels. Offsetting the loss in bulk cargoes was a growth of 5.4 million tons of containerized cargo port-wide, while break bulk cargo including forest products, miscellaneous break bulk and bagged cargoes also increased. Liquid bulk exports and domestic shipments, primarily petrochemicals, increased over the period, despite the lower petroleum exports and imports. Between 2018 and 2022, petroleum imports and exports fell by 27 million tons while petrochemical exports and imports grew by 24 million tons. The import and export of containerized cargo is more labor intensive then the handling of import and exported crude petroleum, and similarly the export of petrochemical products, is more labor intensive on a per ton basis than the handling of export and import crude petroleum. Therefore, the strong growth in containerized cargo over the period along with the 24-million-ton growth in petrochemical cargo and the increase in break bulk cargoes resulted in a growth in overall economic impacts supported by the public and private terminals along the Houston Ship Channel within the Houston Ship Channel District. Exhibit V-1 compares the change in tonnage handled at the public and private marine terminals between 2018 and 2022.

Exhibit V-1
Comparison of Tonnage Handled at the Houston Ship Channel Public and Private Terminals, 2018 and 2022
(1,000 Tons)

COMMODITY TYPE	2022 TOTAL 1,000 TONS	2018 TOTAL 1,000 TONS	CHANGE TOTAL 1,000 TONS
Containers	35,255	29,818	5,437
Autos/RoRo	465	378	87
Steel	6,689	8,089	-1,400
Break Bulk Cargo	3,204	2,392	811
Bulk Grain	5,625	4,770	855
Bulk	205,529	218,470	-12,941
Total	256,767	263,918	-7,150

Totals may not add due to rounding

1. COMPARISON OF TOTAL PORT-WIDE IMPACTS

Exhibit V-2 presents a comparison of the total impacts generated by both public and private terminals.

Exhibit V-2
Comparison of Economic Impacts: 2018-2022
Public and Private Marine Facilities

	2022	2018	Change
JOBS			
Direct	78,308	67,039	11,270
Induced	138,161	102,882	35,279
Indirect	68,787	55,103	13,684
Subtotal	*285,257*	*225,024*	*60,232*
Related	1,255,160	1,125,671	129,490
Total	1,540,417	1,350,695	189,722
PERSONAL INCOME(MILLIONS)			
Direct	$6,548	$4,664	$1,884
Re-spending/Local Personal Consumption	$20,329	$12,645	$7,684
Indirect	$2,780	$2,227	$553
Subtotal	*$29,657*	*$19,536*	*$10,121*
Related	$92,471	$54,723	$37,748
Total	$122,128	$74,260	$47,868
TOTAL ECONOMIC VALUE (MILLIONS)			
Direct Business Revenue	$29,557	$25,135	$4,421
Re-spending/Local Personal Consumption	$20,329	$12,645	$7,684
Related Output	$389,332	$301,259	$88,073
Total Economic Value	$439,218	$339,040	$100,178
LOCAL PURCHASES (MILLIONS)	$7,203	$5,684	$1,519
STATE/LOCALTAXES (MILLIONS)			
Direct, Induced, Indirect	$2,580	$1,485	$1,095
Related	$8,045	$4,159	$3,886
Total	$10,625	$5,644	$4,981

Totals may not add due to rounding

Direct jobs increased by 11,270 new jobs since 2018. Induced jobs grew by 35,279 jobs, reflecting the growth in the direct jobs, as well as the increase in the average direct income from $69,565 2018 to $83,613 in 2022. This growth in average income resulted in an increase in the re-spending impact, in turn supporting increased induced jobs and local consumption impact. When direct, induced, and indirect jobs are considered, the port activity at the public and private marine terminals increased by 60,232 jobs due primarily to the growth in jobs associated with the growth in containerized cargo and petrochemicals and other liquid bulk cargoes. Jobs with importers and exporters using the

public and private marine terminals grew by 129,490 jobs, also reflecting the growth in containerized cargo as well as petrochemical exports. The total economic value of the Houston Ship Channel public and private terminals to the state of Texas grew by $100.2 billion, reflecting the total economic value supported by containerized cargo and liquid bulk cargo moving via these terminals.

2. COMPARISON OF PHA IMPACTS

Between 2018 and 2022, tonnage handled at PHA terminals increased by 14.2 million tons, as shown in Exhibit V-3. This growth reflects an 8.4 million ton increase in containerized cargo at the PHA facilities, a 3.4 million ton increase in bulk cargo (driven by a 2.1 million ton increase in liquid bulk cargo and 1.2 million ton increase in dry bulk cargo), and a 1.1 million ton increase in break bulk cargo (primarily forest products, followed by bagged cargoes and miscellaneous break bulk cargo) at the PHA terminals since 2018.

Exhibit V-3
Comparison of Tonnage Handled at the Houston Ship Channel Public and Private Terminals, 2018 and 2022
(1,000 Tons)

COMMODITY TYPE	2022 PHA 1,000 TONS	2018 PHA 1,000 TONS	CHANGE PHA 1,000 tons
Containers	34,951	26,588	8,363
Autos/RoRo	182	218	-37
Steel	5,203	4,364	840
Break Bulk Cargo	1,592	483	1,109
Bulk Grain	1,908	1,375	533
Bulk	11,226	7,835	3,390
Total	55,061	40,863	14,198

Source: PHA Tonnage Statistics

Exhibit V-4 shows the growth in economic impacts generated by the strong tonnage gains at the PHA owned and leased terminals.

Exhibit V-4
Comparison of Economic Impacts: 2018-2022
PHA Facilities Only

JOBS	PHA Terminals 2022	PHA Terminals 2018	Change
Direct	30,161	21,109	9,051
Induced	52,705	32,222	20,483
Indirect	26,494	17,351	9,143
Subtotal	*109,360*	*70,683*	*38,677*
Related	870,135	627,494	242,641
Total	979,495	698,177	281,318
PERSONAL INCOME(MILLIONS)			
Direct	$2,494	$1,459	$1,035
Re-spending/Local Personal Consumption	$7,743	$3,956	$3,787
Indirect	$1,071	$701	$370
Subtotal	*$11,308*	*$6,117*	*$5,191*
Related	$69,990	$30,202	$39,788
Total	$81,298	$36,319	$44,980
TOTAL ECONOMIC VALUE (MILLIONS)			
Direct Business Revenue	$9,036	$5,362	$3,674
Re-spending/Local Personal Consumption	$7,743	$3,956	$3,787
Related Output	$245,175	$164,074	$81,101
Total Economic Value	$261,953	$173,392	$88,561
LOCAL PURCHASES (MILLIONS)	$2,774	$1,790	$984
STATE/LOCALTAXES (MILLIONS)			
Direct	$217	$111	$106
Induced	$674	$301	$373
Indirect	$93	$53	$40
Subtotal	$984	$465	$519
Related	$6,089	$2,295	$3,794
Total	$7,073	$2,760	$4,313

Totals may not add due to rounding

Since 2018, the overall jobs supported by the cargo moving via the PHA owned and leased facilities grew by 281,318 total direct, induced, indirect and related jobs. The direct jobs generated by the PHA owned and leased marine terminals grew by 9,051 jobs. Induced jobs increased by 20,483 as the result of the increased number of direct jobs as well as the growth in the average salary of the direct job holders. The average salary received by the direct jobs' holders increased from $69,123 to $82,689 over the period reflecting the growth in wages especially in trucking. Indirect jobs increased by 9,143 jobs due to the increased local purchases of nearly $1.0 billion since 2018. As the result of the growth in containerized cargo handled at PHA facilities, an additional 242,641 users' jobs were supported by the activity at the PHA terminals, reflecting the growing sphere of influence of the Houston Ship Channel to serve importers/exporters in Texas that were previously served via out of state ports.

The overall economic value in the State that the cargo handled at the PHA facilities generated increased by $88.6 billion and the state and local taxes supported by the cargo operations at the PHA facilities increased by $4.3 billion since 2018.

3. SUMMARY

In summary, the public and private marine terminals along the Houston Ship Channel continue to be an economic engine for the Houston area, Harris County, and the state of Texas. The importance of the port's public and private marine terminals to the state is underscored by the fact that the total value of the economic impact of the public and private marine terminals is measured at $439.2 billion and 1,540,417 jobs in the state of Texas are related to the marine activity at the public and private terminals along the Houston Ship Channel. The 15.5-million-ton increase in containerized cargo since 2018 was the key catalyst of the strong growth in economic impact since 2018 and demonstrates the need to continue investment in land side and Ship Channel infrastructure to accommodate the growing demand for maritime services along the Houston Ship Channel.